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FLOOR PLANS FOR SMALL COOPERATIVE DAIRY PLANTS

By

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COOPERATIVE RESEARCH AND SERVICE DIVISION

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The Cooperative Research and Service Division has had numerous calls to help in planning the remodeling of plants and the arrangement of floor plans for new plants. To meet these service calls, in part at least, blueprints have been collected and copied and several floor plans have been drawn based on combinations of the better features shown. These have been prepared for distribution to interested persons and associations.

These plans are all for comparatively small plants, as large associations usually employ their own capable architectural and engineering services.

The Cooperative Research and Service Division conducts research studies and service activities relating to problems of management, organization, policies, merchandising, sales, costs, competition, and membership arising in connection with the cooperative marketing of agricultural products and the cooperative purchase of farm supplies and services; publishes the results of such studies, confers and advises with officials of farmers' cooperative associations; and cooperates with educational agencies, cooperative associations, and others in the dissemination of information relating to cooperative principles and practices.

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FLOOR PLANS FOR SMALL COOPERATIVE DAIRY PLANTS

by

D. D. Brubaker
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During recent years there has been a great increase in the volume of products handled by farmers' cooperative dairy associations and many of them are enlarging their plants or are building or planning to build new plants to handle the increased business. Another trend, accelerated by war conditions, has been the organization of cooperative pasteurizing and retailing associations, mostly of producer-distributors in the southern areas of the country. They all want or will want new plants.

To meet an increasing demand for advice and assistance in planning for expansion or remodeling of plants and for new plants, the Cooperative Research and Service Division has assembled and studied numerous plans, some of which have been copied and some of which have included ideas which could be recommended in modified form or in combination with other plans. A few of these are presented here for the use of those who contemplate building or remodeling small plants. It is assumed that associations operating large dairy businesses will employ competent technical advice before building, to adapt proposed plans to their individual situations.

In presenting these simple plans, there is no suggestion that any of them will be wholly suitable for use by any association. The thought is to offer the planning experience of others to those who may glean from it helpful suggestions and ideas.

Cooperative dairy businesses grow. For many years associations have had the problem of expanding facilities to accommodate increasing volume of product. In many cases decisions have been postponed. The great increase in dairy production of the last few years, to meet war needs, has brought about conditions that require prompt attention. Another imperative factor is the pressure by health departments and consumers for better and more sanitary handling of food products.

Some dairy plants are like Topsy - they just grew that way. Often associations have purchased or rented buildings and remodeled them to begin operations. Frequently, because of the shortage of funds, this seemed the only way to start and it should not be condemned too severely. Such economy has not always been necessary, however, and sometimes it has resulted in greater costs in the end. Rarely do we see a remodeled

NOTE. - *Acknowledgment is made of the assistance in the preparation of this material by C. E. Clement, marketing specialist, and Frank A. Bele, senior agricultural economist, both of the Dairy Branch of the Production and Marketing Administration.*

building that is in a good location or that meets the needs of the business. Improvements made in them usually are makeshifts and sometimes are an entire loss when moving to other quarters.

Sometimes dairy buildings, designed for specific operations, have been poorly planned. Unfortunately, competent dairy architectural and construction services are not always available and even when available have not always been engaged. In many cases it will be found that the most capable architectural and construction services that can be employed will prove to be the cheapest in the long run.

The possibility of the future enlargement of a plant is an important consideration. Usually it is inadvisable to build a plant too much oversize for the present volume to accommodate an unknown increase at a later date. The increased interest expense on the investment; the length of steam, water, and refrigeration lines; and the extra distances employees must travel, all add to operating costs. However, so many plants are crowded for room that a slight oversize in all departments seems advisable, particularly for new associations.

Often buildings can be designed to be enlarged by adding to the ground-floor plan on one side or one end. This is comparatively easy in a milk-cooling plant, a creamery, or a cheese factory in which there is only the one operation. It becomes more difficult when the number of operations increases, because there are more rooms that should be on outside walls and the wall space of the ordinary rectangular building isn't enough. An ell-shaped building usually helps to correct this deficiency.

As an illustration of the need for space as operations increase, a milk distributing business will want its office and retail store on the front. That leaves three sides for the receiving room, cold-storage room, hardening room, bottle washer, can and case storage room, and boiler room. This puts the milk pasteurizing room, ice cream room, and dry-storage room on the inside with skylights and the arrangement must permit the flow of product from each operation to the next without extra pumping or delay. One way of relieving this situation is to locate the refrigerating equipment and boiler in an outside building. This suggestion meets with almost universal objections, but where it has been done, it has proven satisfactory. When a one-story plant is being planned, the possibilities of growth and expansion should be considered and provisions made for them.

Figure 1 is a drawing that illustrates one way in which a 40 by 60 foot milk-cooling plant (solid lines) might be enlarged (broken lines) to 60 by 100 feet in size, to permit addition of butter and powder operations or cheese making. In this plan a 20-foot section of wall would be removed to enlarge the boiler room. The difficulties of enlarging a multiple-operation plant may be observed by studying other plans herewith or by drawing a plan to accommodate your own envisioned operation.

Another expansion possibility is the planning of a two-story building. Most planners object to this on the grounds that operating expenses are higher for small volumes of product when the full time of employees is

not required in all departments. For larger volumes this objection often is eliminated. Frequently hill-side plants have been economical and advantageous. In areas where basements can be constructed, they offer much valuable space. Some plants have boilers and refrigerating equipment and store rooms in the basements. Some basements are used for car and truck parking space. It is not recommended that dairy operations be carried on in basements. They may be damp and may not have sufficient light or ventilation. If there is a possibility of building a second floor, after a one-story building has been erected, complete plans for both construction and operation should be determined before work is started. A concrete floor with proper supports should be laid with openings for piping, wiring, stairs, elevators, and drains. Then it will be necessary only to raise the roof and build up the walls. Provision has been made in plan 24 for a second floor, to house the offices when it is decided to convert the present ground-floor office into a retail ice-cream sales room.

It is suggested that prospective dairy-plant builders will derive much benefit from visiting other plants and getting information as complete as possible from officers, managers, and patrons. We repeat the advice that, always, the best architectural and construction service available should be engaged. A poorly constructed building is a liability.

Another piece of precautionary advice is to make ample financial provisions before starting construction or letting contracts. Many things are needed besides a building and the major pieces of equipment. Too many organizations run short of funds before they are ready to start operations.

INSIDE THE PLANT

It is not the intention here to go into detail about internal arrangements or to discuss dairy equipment. However, the floor plans illustrated herein will present a number of ideas about room arrangement. Equipment and the numerous methods of operating are too big a subject for this publication. Yet, a word about the receiving room may be timely.

Many receiving rooms are too small - just large enough for a scale and a round-can washer. Many of them are on the ground floor level. A room 10 or 12 feet wide and long enough to accommodate the largest can washer that may be needed for any prospective volume of milk is advisable and the floor should be raised to about the level of a wagon or truck bed, say 42 inches or more. A modern can washer with dump rail or can cradle and a cover-replacing device usually saves one man in the receiving room. Proper floor and equipment levels facilitate this saving and sometimes eliminate one milk pump as well as saving the dump man. This advice does not fully apply to very small plants. But when a plant receives over 2,000 gallons a day, with around 110 pounds weight of milk and can to be lifted for each 85 pounds of milk, dumping is a tedious job. It pays to save good men even when help is plentiful.

Figure 2 illustrates a receiving room with a raised floor and shows the can-conveyor level. If the incoming conveyor is on a level with the

track in the can washer, it will be 25 or 30 inches above the receiving room floor. The truck man will have to lift his cans that height unless there is an elevated driveway. The outgoing can conveyor will be 5½ or 6 feet above level ground and gravity will carry the cans from the washer high enough for the truck man to reach without getting off his truck. Otherwise a power conveyor should be installed.

Another suggestion about the inside of plants refers to the size of rooms. We have cautioned about building oversize plants but many rooms are too small even for the initial volume of product, particularly cooler rooms in pasteurizing plants. This is very noticeable in recent years.

To illustrate: The common wooden crate, holding 12 round quart bottles, covers almost 2 square feet of floor space. Stacked 6 crates high they carry 18 gallons, about 9 gallons or 77 pounds of milk per square foot. If half of the cooler room space is needed for case conveyor, aisles, and working space, there will be room for less than 40 pounds per square foot. Besides, cans of milk and crates of smaller bottles, cartons of cottage cheese and butter also take up room. We have seen coolers carrying 50 pounds of milk per square foot that were so crowded that crates were stacked 7 or 8 high. Similar consideration should be given to the bottle-washer room where returning drivers check in and where empty cans and cases are stored.

A retailing business delivers its products every day. The situation is different in a creamery or cheese factory where products are held to accumulate truckloads or carloads. Cheese plants may encounter another condition if there appears to be an advantage in aging cheese or packaging it. The point is that provision should be made in cooler and curing rooms for probable maximum volume and storage needs.

In a pasteurizing plant the bottle-washing, pasteurizing, and cooler rooms must come together or be conveniently near to each other to facilitate the work. Bottles should pass from the washer through the filler and capper and into the cooler by the shortest possible route.

A noticeable defect of many plants is inadequate toilet facilities. We have seen plants without toilets. Many have only one men's room. Farm women come into plants and should be accommodated. Women workers in plants and offices are common nowadays. In southern areas separate toilets are provided for white and colored workers. Provisions should be made for every contingency in this respect.

Of course water, sewer, and electricity are essential and either a gas connection or a means of receiving coal is necessary. These are among the "Firsts" that cannot be overlooked.

ATTRACTIVE PLANTS

A dairy plant should be a thing of beauty in an attractive setting. It is good business and good advertising to produce a better pound of butter or a better quart of milk and to build a reputation for quality, but when the plant is hidden on a back street or is in a crowded storeroom, unattractive inside and out, quality and advertising lose some of their force.

The building lot should be on a heavily traveled street or highway where many people and cars pass each day. It should be at least 1 to 5 acres in size, depending on the operation and other factors. The plant should be set back of an ample lawn, with good landscaping, and the view of it from the highway should not be obstructed. A dairy plant, whether a retail plant or a processing operation, should be a place everybody will want to drive into because it looks so nice.

Internal features can add attractiveness. A large entrance hall with plate-glass windows looking into the work room creates interest. A handsomely furnished, upstairs club room, where church circles, literary clubs, and parent teachers' associations can hold their meetings and play cards is good advertising. A butter-and-cheese sandwich or a dish of ice cream served to club-room guests costs little and adds to the lure.

In the past, about all farmers have done over much of the country is to build a cross-roads plant for collecting milk or cream, do a little processing, and then turn over the product to someone else who conducts the more profitable marketing. It is time now for farmers to dress up, to advertise and present their wares, and to sell them.

Nothing is too good for a farmers' dairy plant.

CONSTRUCTION COSTS

Frequently, when we have assisted in drawing floor plans, we have been asked to estimate the cost of construction. The only way to get a reasonably accurate estimate of the cost of putting up a dairy plant is to get a contractor's bid. Estimates are always hazardous, particularly in times of unusually high and changing prices. Normally, building costs vary from area to area because of transportation, building material, and labor costs and in some cases possibly more than for other reasons inability to find contractors who have had experience in building dairy plants.

Costs cannot be estimated accurately by a layman by any known rule-of-thumb method, although such estimates occasionally may happen to be reasonably close. Different persons have rules for calculating costs according to the square feet of wall space or floor space or the cubic feet of space within the building. The latter method is used frequently. In using it the cost per cubic foot must be adjusted to the kind of material and the number of rooms or partitions and other factors.

We have measured a number of small, one-story, frame dairy buildings with concrete foundations and floors that years ago cost from 17 to 20 cents a cubic foot. Similar plants of tile, brick, cinder, or concrete blocks usually cost from 25 to 40 cents at that time. Our more recent prewar observations indicated that small plants for a single operation, like cooling milk or making butter or cheese, when built of brick or concrete blocks cost from 25 to 30 cents per cubic foot. To illustrate: Assume a one-story, 60 by 60 foot brick building. With a 12 foot ceiling, 2 foot foundation, and 2 foot coping, the total height would be 16 feet

and the space would be 57,600 cubic feet. At 25 cents per cubic foot, the cost would be $14,400. We know of a similar plant, with a 30 by 30 foot outside boiler house that cost just over 28 cents a cubic foot for both buildings. Probably the dairy plant alone cost 30 cents or more although that figure is not available.

Too much confidence should not be placed in these cost figures or in this method of calculation. They are given here for purposes of illustration only.

For purposes other than estimates, many persons have calculated total investments - that is total assets on the balance sheet - per daily pound of product handled. Such cost figures are not reliable guides to what construction and equipment costs may be. They show only the investment in each case that is studied at the time of study. During the war many plants worked long hours and handled much more than their rated capacities. We have a record of one farm separated cream butter plant that worked double shifts in a crowded plant, with an investment of less than 2 cents per pound of annual make. We know of a creamery that produced over 4 million pounds of butter in three 1,000-pound churns in a year. Investment and construction costs based on products are not valuable under such conditions.

The average initial investment in total assets of 13 cooperative milk distributing plants built before 1940 is given by Herrmann and Welden[1] as $8.26 a daily pound of milk. The investments of many associations run considerably above and below this figure but we consider it a reasonable average for a complete plant in use to capacity. It is the best figure available for average total assets for that type of operation.

ILLUSTRATIONS OF FLOOR PLANS

In presenting the floor plans shown herewith we wish to emphasize again that they are given only for the suggestions that may be found in them. Room sizes and arrangements can be changed, basements and second floors can be added, or other alterations made to suit the conditions and wishes of each association. The volume of product, the processing operation, the type of equipment, the size, shape, and location of the lot, the available funds and other matters will influence the size, style, and cost of a dairy plant.

Many of the plans and blueprints we have received show equipment in place. In a way that is good, but for the reason that these plans illustrate new equipment of specific sizes and makes whereas many associations will use the equipment they now have, and for the further reason that many changes in dairy equipment are now taking place, we have omitted illustrations of equipment from most of our drawings.

Some of the drawings indicate plant capacities. As already mentioned, overtime work and the pressure of recent demands have disrupted all estimates of the volume a plant can handle. One pasteurizing plant

[1]Herrmann, L.F., and Welden, W. C. Distribution of Milk by Farmers' Cooperative Associations. Farm Credit Administration Circular C-124. 1941. See p. 23.

prepared to handle an estimated maximum of 1,000 gallons a day. It received an average of over 2,500 gallons a day for weeks and reconstituted up to 1,000 gallons in addition. Many other similar instances could be cited. The indicated capacities here are the minimum volumes for efficient operations.

Further information on planning for efficient operations will be found in other publications of the United States Department of Agriculture.[2]

Figure 3. - This plan is not a copy of a blueprint but combines features from several plans. The raised, open platform within the building line permits the storage of cans outside the plant for the convenience of haulers who live in town and start out early, and for school children who bring in the milk but go home after the plant has closed. The raised floor in the receiving room has been discussed in the foregoing text. With slight modifications the plant can be enlarged on either end.

Figure 4. - This is a copy of a plant now being operated. At present the internal partitions have not been built for a salesroom and ice-cream room, but the space has been left for that purpose when the time comes for such expansion. Herewith is a list of dairy equipment installed in this plant by the Creamery Package Company to equip it for cooling milk.

2 - Creamery Package 5 x 5 ammonia compressors	$1,770.00
2 - 15 HP motors with across-the-line starters	372.00
1 - Sweet water tank including coils, headers, surge drum, agitators and tank	4,304.00
1 - 12" diameter by 14' - 0" long ammonia receiver	147.00
2 - "V" belt drives	94.00
1 - CP 7M 51-304 air cooling unit	260.00
1 - 7½ HP sweet water pump	171.00
1 - King Zero 25-ton evaporator condenser	1,575.00
Necessary contents, piping, fittings, and ammonia to complete installation of equipment	959.00
1 - CP 10 can per minute can washer	3,150.00
1 - CP double compartment weigh can	1,340.00
2 - CP 800# compact receiving units	880.00
2 - CP dump rails and gird	230.00
1 - Kron #4151 dial scale	540.00
1 - CP plate cooler	3,500.00
2 - CP 2,000 gallon milk storage tanks	5,191.34
1 - DeLaval #192 separator	3,090.00
1 - DeLaval #138 clarifier bowl	1,795.00
1 - Service kit for separator	30.00

[2]Wilson, H. L. Points to Consider in Establishing a Cheese Plant. U. S. Dept. Agr. Misc. Pub. 42, December 1928.
Clement, C. E.; Bain, J. B.; and Grant, F. M. Equipment for City Milk Plants. U. S. Dept. Agr. Cir. 99. Rev. June 1932.
Grant, F. M., and Clement, C. E. Small Plants for Pasteurizing Milk. U. S. Dept. Agr. Cir. 214. March 1932.
Clement, C. E.; Bain, J. B.; and Grant, F. M. Construction and Arrangement of City Milk Plants. U. S. Dept. Agr. Cir. 228. June 1932.
Clement, C. E. Country Milk-Receiving and Cooling Stations. U. S. Dept. Agr. Cir. 432. June 1937.

1 - Lot sanitary fittings	$500.00
1 - Lot sanitary pipes	300.00
Excise tax on refrigeration	304.20
1 - #55 Waukesha BB milk pump	650.00
	$31,152.54

Figure 5. - This is a small country creamery owned by the Twin City Milk Producers Association. It has now been closed. It received only farm separated cream. The office, test room, and receiving room floor levels are above the plant floor. We have added a women's room and have made one or two other alterations.

Figures 6 and 7. - These are not copies of blueprints. They are identical except for arrangements of office and cooler rooms. In figure 7 the entry could be put on the end where the manager's office is and the building could be enlarged on the present front. That would leave the manager's office without outside windows. A second floor for supply storage has not been illustrated.

Figures 8 and 9. - The plan shown in figure 8 is the street-floor level of a new hillside plant of the Illinois Agricultural Association. Figure 9 shows the lower floor. Both milk and cream are received in the same room.

Figure 10. - This plan represents a combination of features of several sour-cream butter plants. The intake in the workroom was copied after the plan of the Nemaha plant at Sabetha, Kansas, which has the fastest cream-receiving method we have seen.

Figure 11. - The major dairy equipment is shown in place in this drawing. Apparently more space should be given to cooler and curing rooms. This floor plan can be enlarged on either end or the front, with only minor changes.

Figure 12. - The capacity of this plant can be doubled by building a cooler and curing room in the ell and using the present cooler and curing-room space for vats and presses.

Figure 13. - This cheese plant is 48 by 108 feet, and has 5,184 square feet of floor space and 312 linear feet of outside wall. A 72 by 72 foot plan would have the same floor space but only 288 feet of outside wall. More outside wall space is advantageous, allowing more receiving and delivery space on the outside, and roof supporting is easier in a narrow building but the cost per square foot of floor may be slightly higher than in a more nearly square building.

Figure 14. - The front of this plant is on the narrow end. For display, it is usually better if the wide side is the front. The indicated capacity can be realized only with holding tanks and by working two shifts.

Figure 15. - This floor plan for a small pasteurizing plant shows economical use of space but enlargement would be difficult because either a receiving or a delivery room is on each side.

The following is a copy of milk equipment listed in an invoice for a new pasteurizing plant which has handled over 2,500 gallons of milk a day. Too much confidence should not be placed in the prices shown or in the adequacy of these items to properly handle 2,500 gallons. They are presented simply as a rough estimate of the possibilities of over-all costs. The manager of this plant has already ordered several additional pieces of milk equipment and, as volume grows and when ice cream production starts, the cost of equipment may exceed $40,000.

500 lb. scale, 500 lb. weigh can, 800 lb. receiving vat	$1,727.00
1,000 gallon holding vat with agitator and cooler	1,777.00
2 - 300 gal. round pasteurizing vats	3,720.00
1 - 48 tube, 8' x 1" cooler with covers	628.00
6 wide, 40 per minute bottle washer	2,405.00
Creamery Package #26 filler and capper with motor	1,950.00
25' bottle track, hood, turns, etc. - complete	675.00
No. 32 separator	1,050.00
3 per minute can washer	900.00
5 x 5 ammonia compressor	1,550.00
CP sweet water tank - complete	1,433.00
20 HP vertical boiler, bottles, cases, cans, trucks, valves, fittings, supplies, installing, etc., unitemized	11,659.00
Total of ledger charges	$29,474.00

Figure 16. - This shows a plant slightly smaller than that shown in figure 15 and some space has been given to a dairy store. If the store were eliminated and if gas were used for fuel, the minimum capacity would probably be at least 3,000 gallons.

Figures 17 and 18. - This example shows a two-story plan for a new association which expected to start with about 2,000 gallons a day and anticipated an increase to over 4,000 gallons. If and when it builds it will prepare to make ice cream and operate a dairy store. Additional workroom can be provided by completion of second story. Pasteurizing vats, milk tanks, and ice-cream-mix vats could be placed upstairs.

Figure 19. - The floor plan of the plant of L. S. Heath & Sons, Robinson, Illinois, which was published in the Milk Dealer in August 1944. It houses the milk processing equipment, dairy store, and office. The boiler room and other processing activities are in other buildings. We have not seen this plant but from the Milk Dealer article we think it must be an illustration of the appearance dairy plants should present.

Figures 20 and 21. - Most of the arrangement of this two-story pasteurizing plant is good. It would be better, however, if the compressor room, ice-cream room, and cooler room were closer together.

Figure 22. - This is the work-floor plan of the Miami Home Milk Producers Association's beautiful plant. It has many convenient internal features, a wide lawn, parking space for drive-in customers, plate-glass windows

between lobby and workroom, and a card room upstairs for guests. This organization tried to build a plant large enough to care for expansion in business but is already finding it necessary to plan for more space after only 3 years' occupancy. The second-floor offices and recreation room are not shown here.

Figure 23. - This suggested plan for handling a small volume was supplied to us by an equipment manufacturer. It shows the principal equipment in place, including a round can washer, an upright boiler, a plate pasteurizer, and a sweet water tank.

Figure 24. - This is a copy of a blueprint of the new plant of the Atlanta Dairies Cooperative in which operations were started in August 1945. A concrete slab was laid over the front of the first floor so that offices can be moved upstairs and the present office converted into a retail dairy store. There will be parking space for drive-in customers. The floor plan can be enlarged in the ell at the rear.

Figure 25. - Another suggestion is shown here for the plant to be erected as illustrated in figures 17 and 18. This plan has 1,200 square feet more on the ground floor, which includes the office. A boiler and compressor room is outside.

Figure 26. - This plan offers a possible arrangement of a building purchased by an association as it stands.

Figure 27. - This plan and figures 28 and 29 are modifications of a blueprint supplied by an equipment manufacturer to an association that has outgrown its present plant and is planning a new one on a fine large tract of ground. The blueprint did not have a satisfactory arrangement. This plan is drawn to the scale of the blueprint in the attempt to rearrange the space more conveniently.

Figure 28. - This is another arrangement of space on the scale of the blueprint used for figure 27. The association wants a one-story building to house all departments, including the office and boiler room and wants the broad side to face the street. The dry storage and boiler room positions can be exchanged to put the boiler farther from the hardening room. The objection to this might be that the boiler and compressor, with their smoke and fumes, would be too close to the store. If gas were used for fuel, much of this objection would be removed.

Figure 29. - This is an attempt to arrange the equivalent of floor space in figures 27 and 28 to meet the association's requirements. This plan should accommodate over 6,000 gallons a day.

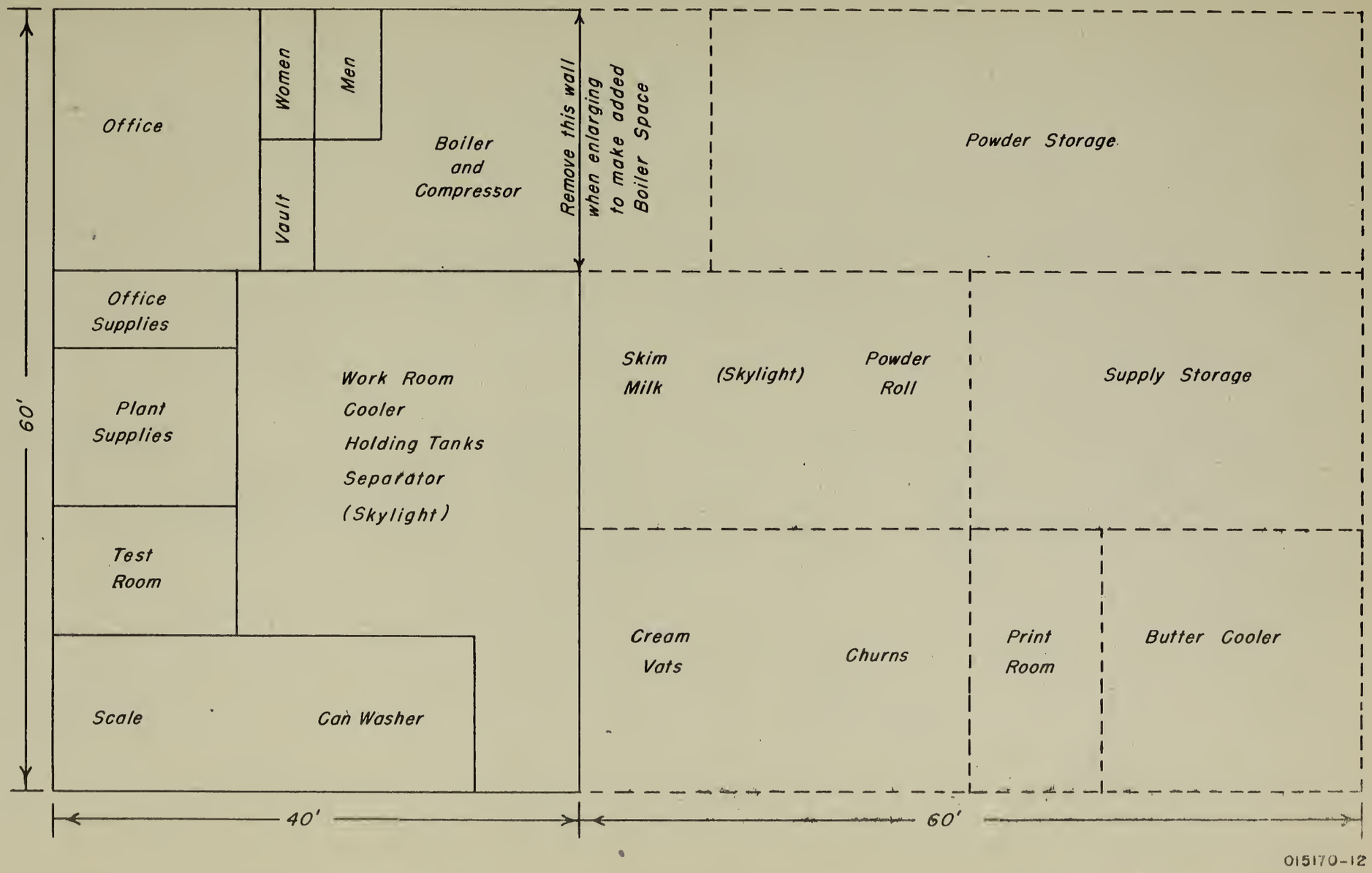

Figure 1. - Plan for enlargement of a 40 by 60 foot plant (solid lines) to 60 by 100 foot size (broken lines).

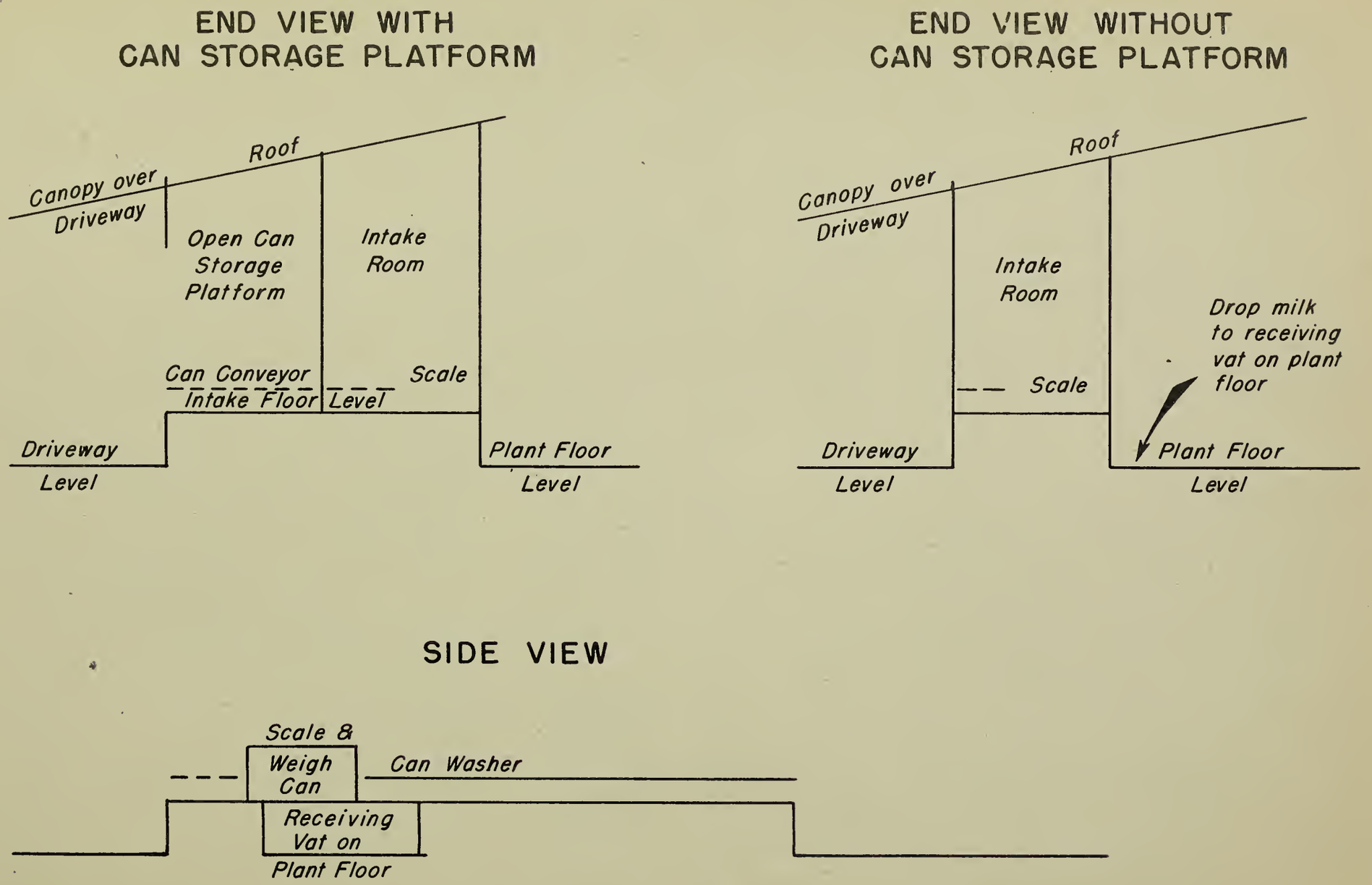

Figure 2. - Illustrations of milk plant receiving room arrangement.

015170-13

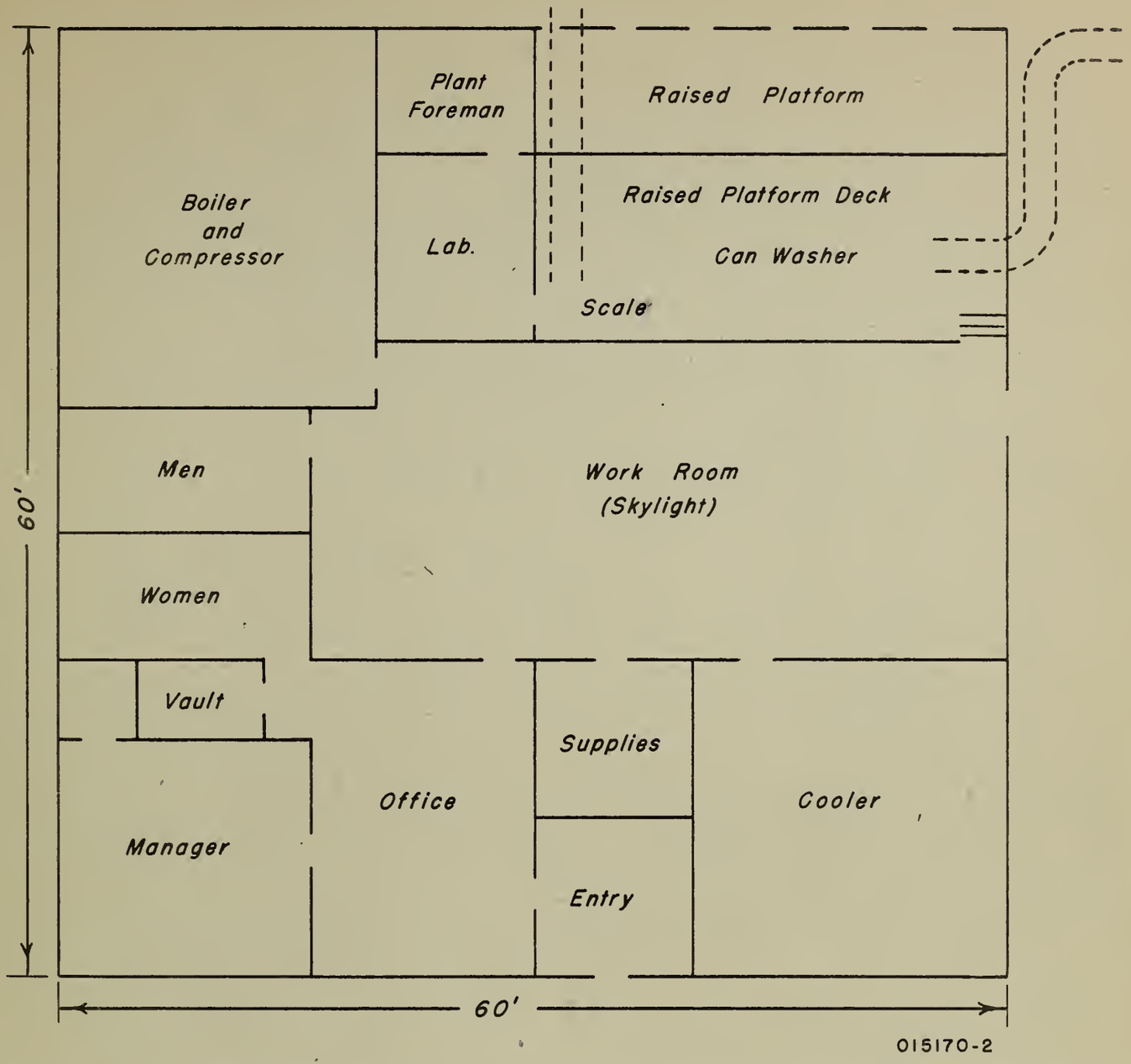

Figure 3. - Suggested floor plan for a milk-cooling plant with 10,000 gallons daily capacity.

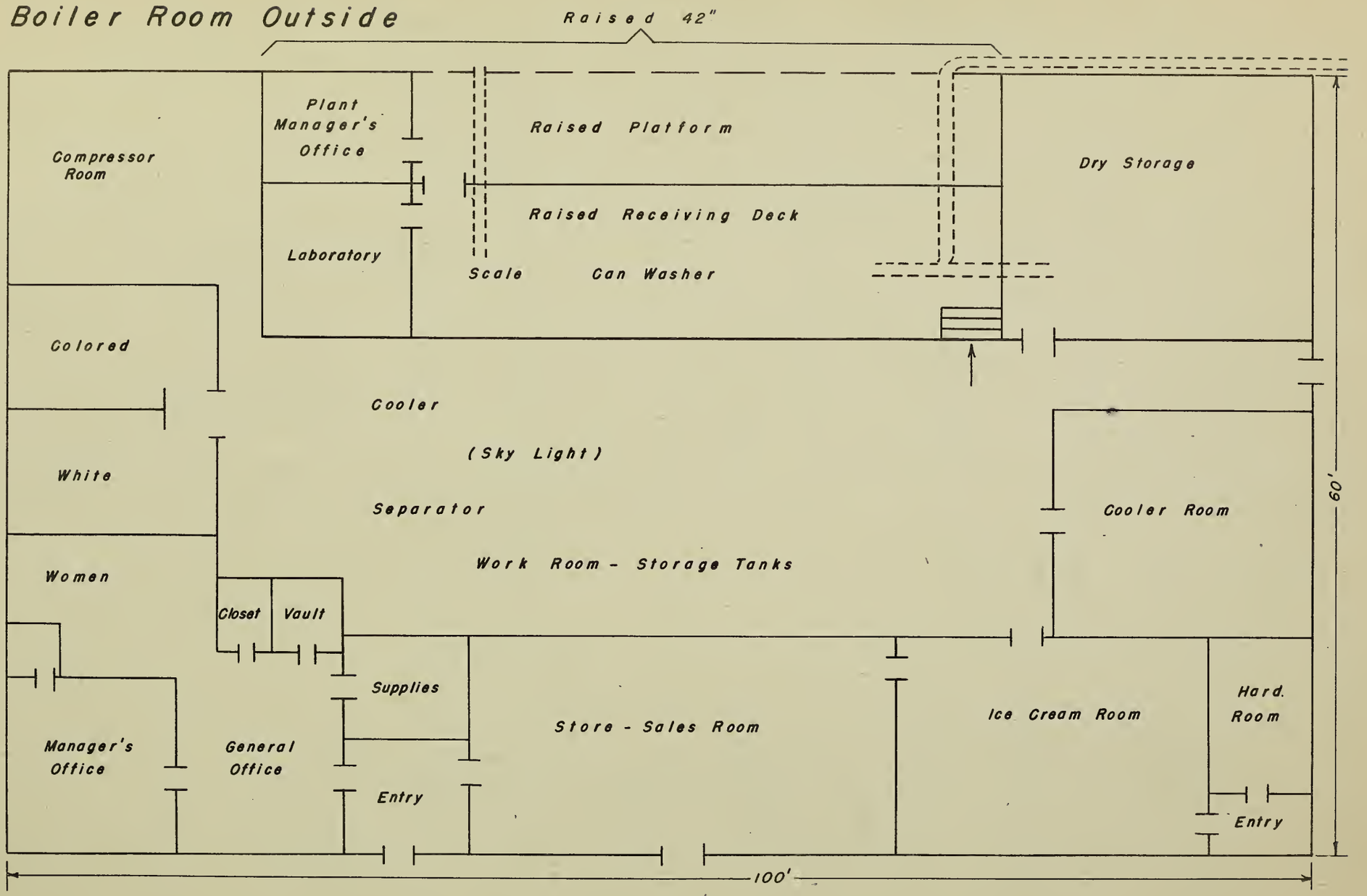

Figure 4. - Suggested floor plan for dairy store and milk cooling plant to handle 10,000 gallons daily.

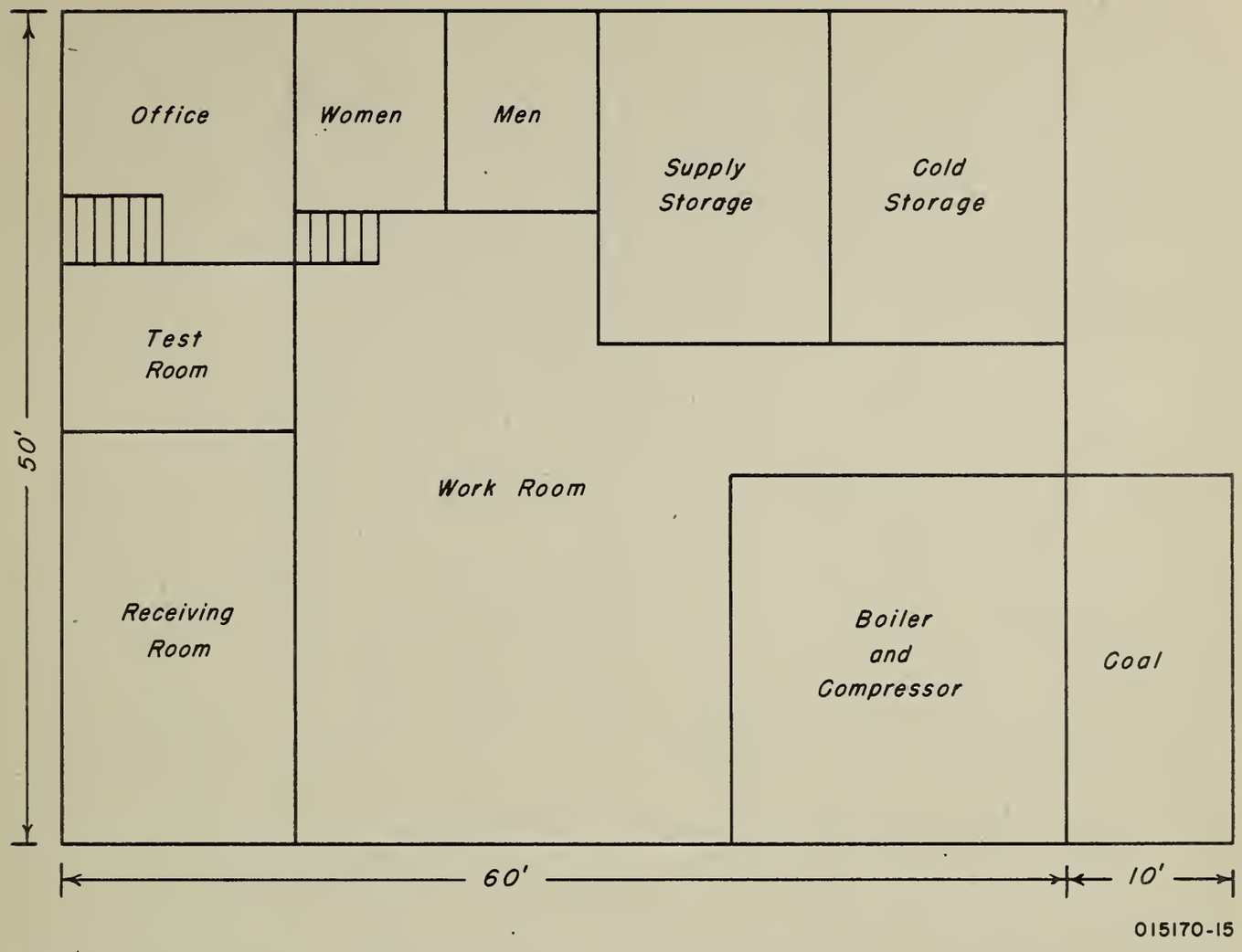

Figure 5. - Creamery for making butter of farm separated cream.

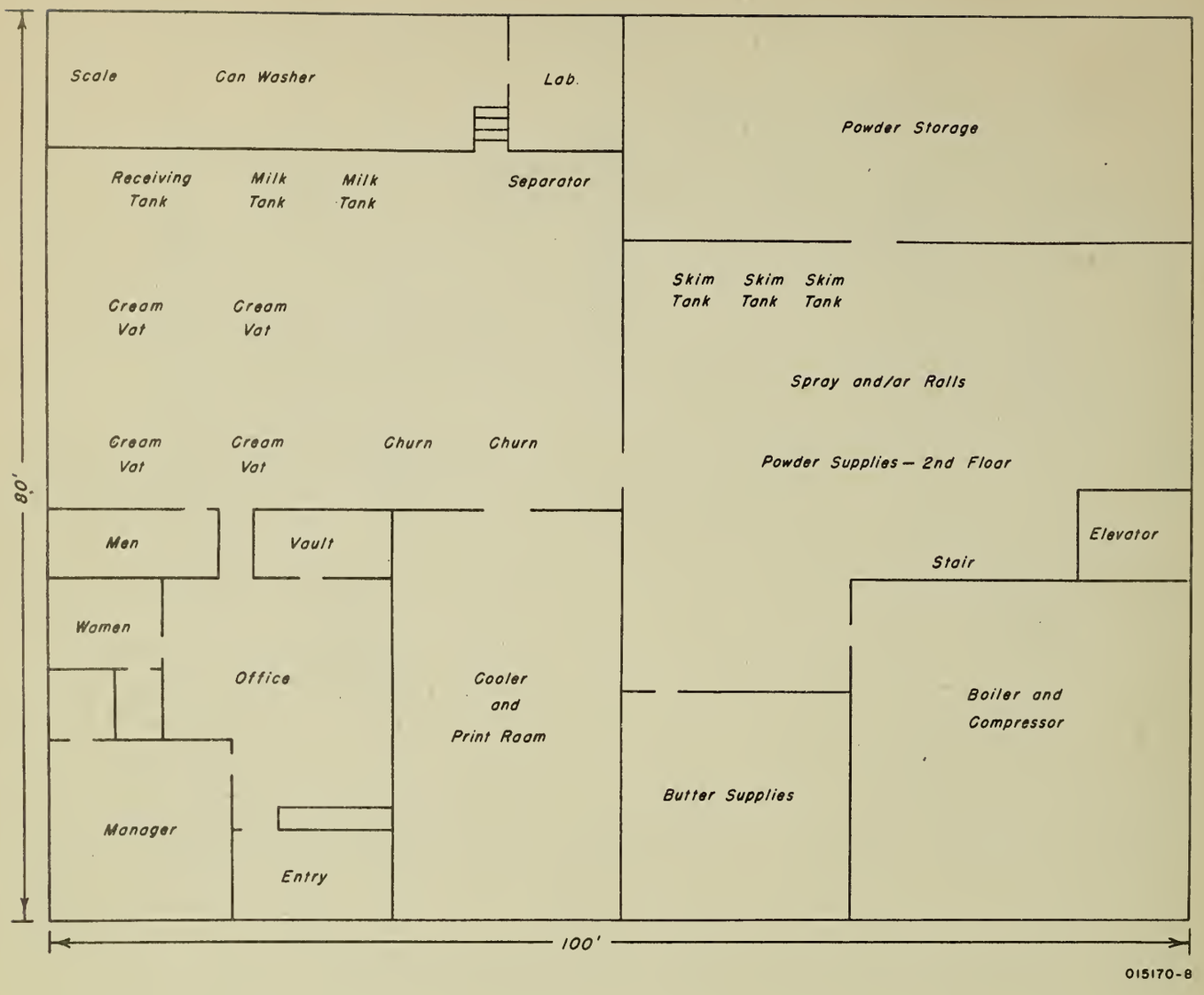

Figure 6. - Butter and powdered-milk plant, capacity 1 million pounds of butter.

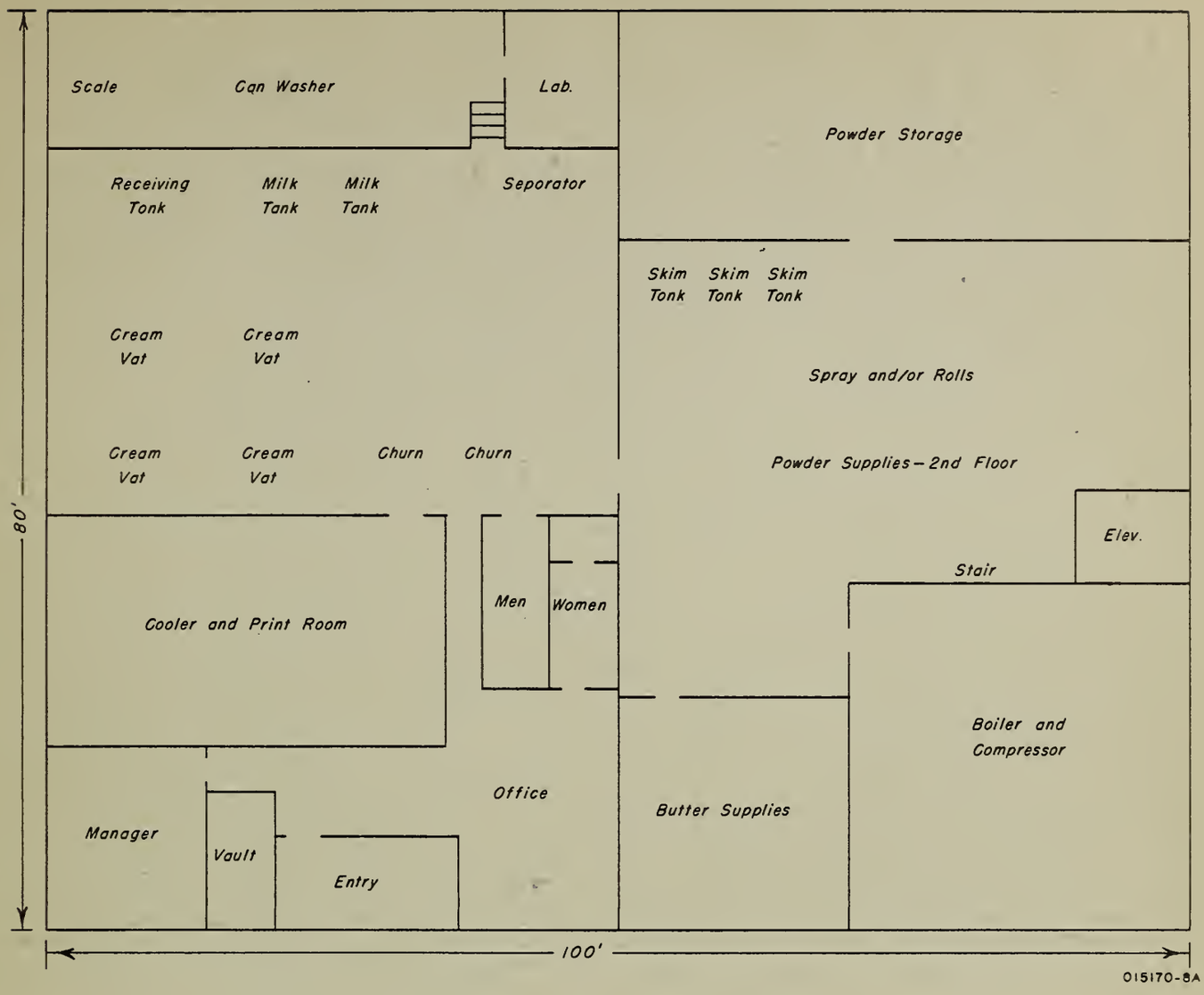

Figure 7. - Rearrangement of space in plant shown in figure 6.

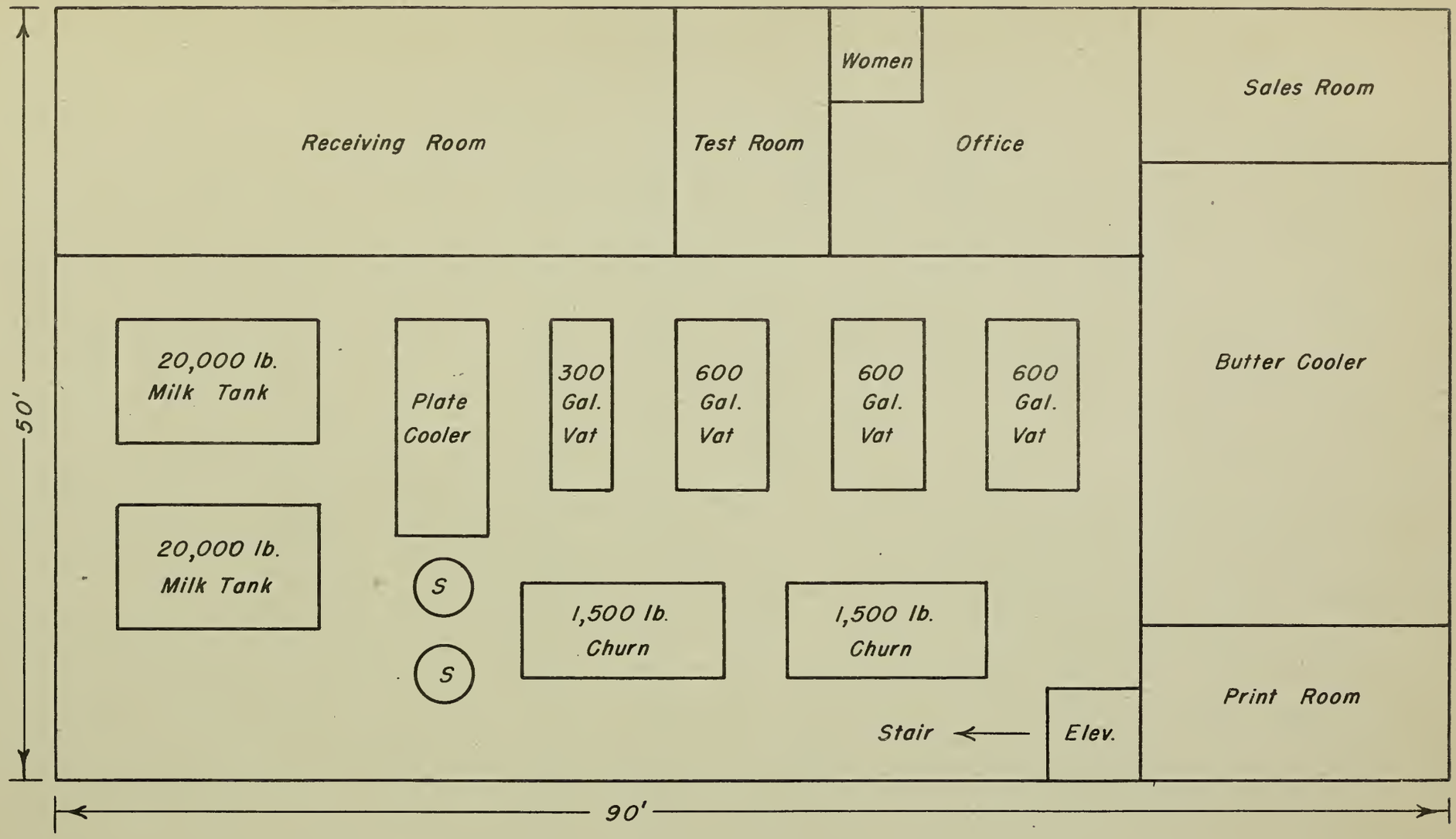

Figure 8. - Two-floor butter and powder plant, capacity over 1 million pounds of butter. (Top floor, hillside street level.)

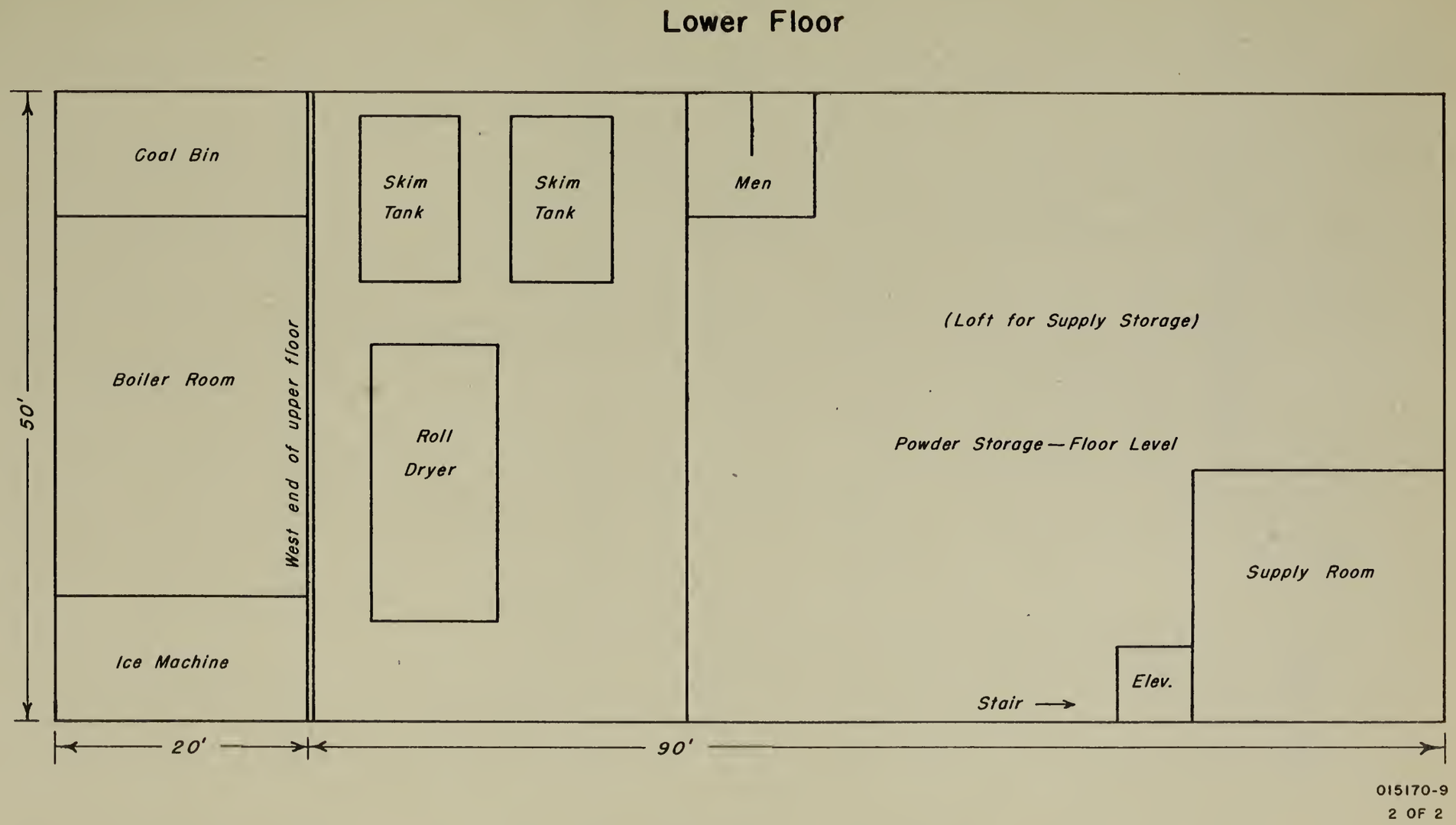

Figure 9. - Two-floor butter and powder plant, capacity over 2 million pounds of powder. (Top floor of plant shown in figure 8.)

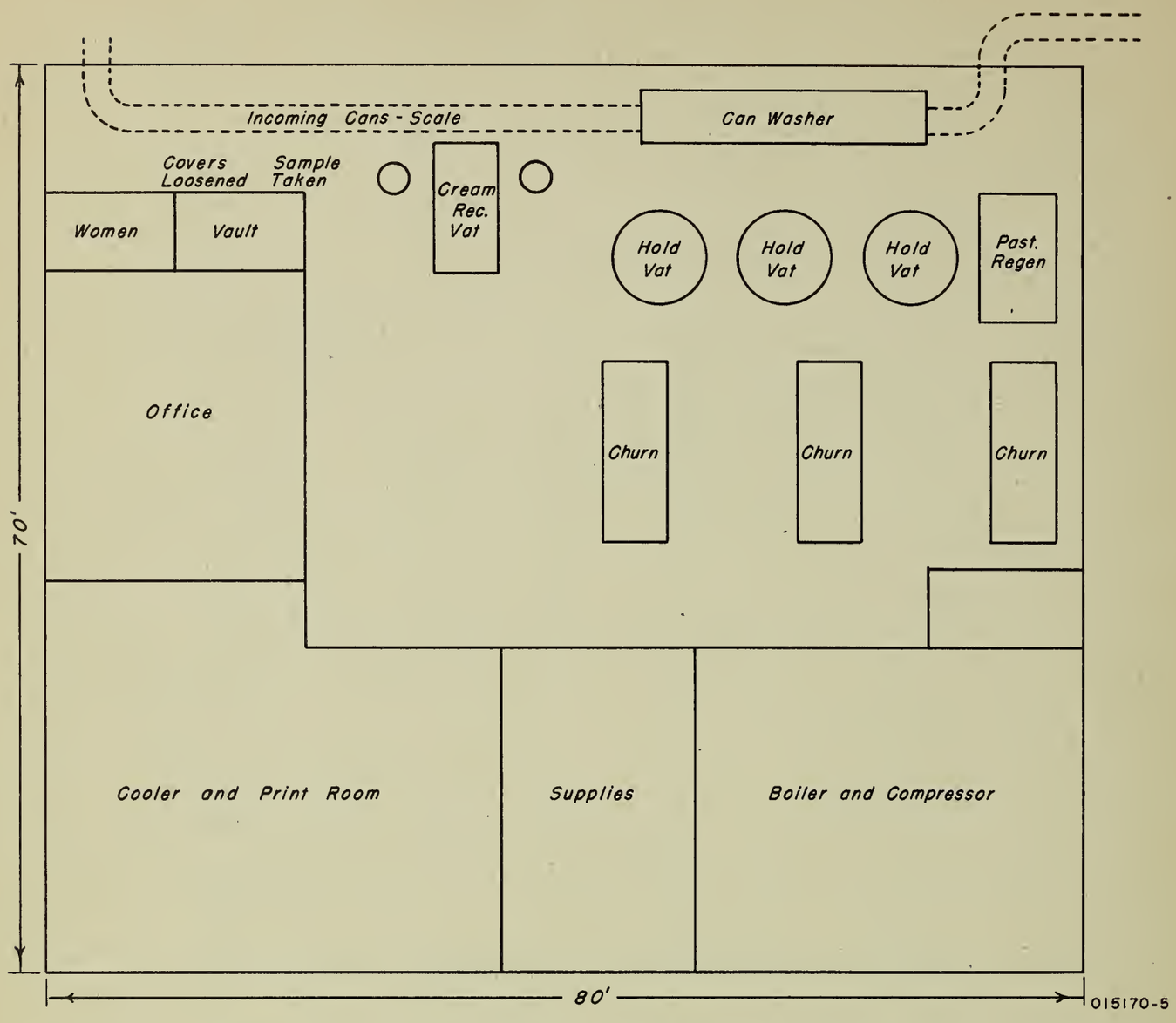

Figure 10. - Suggested floor plan for butter creamery receiving 6,000 to 10,000 pounds of butterfat daily from farm separated cream.

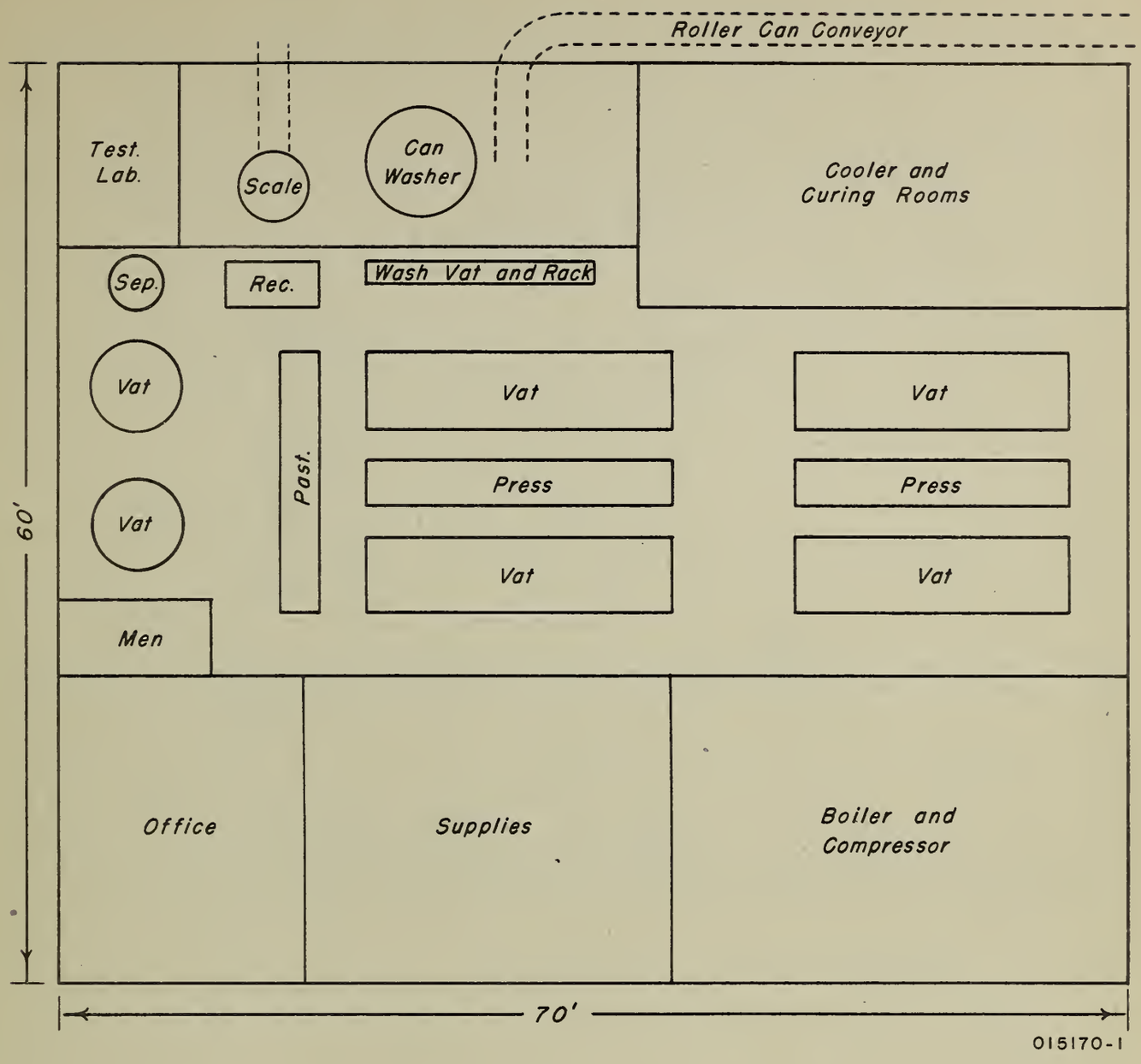

Figure 11. - Suggested floor plan for cheese plant of 40,000 pounds daily capacity.

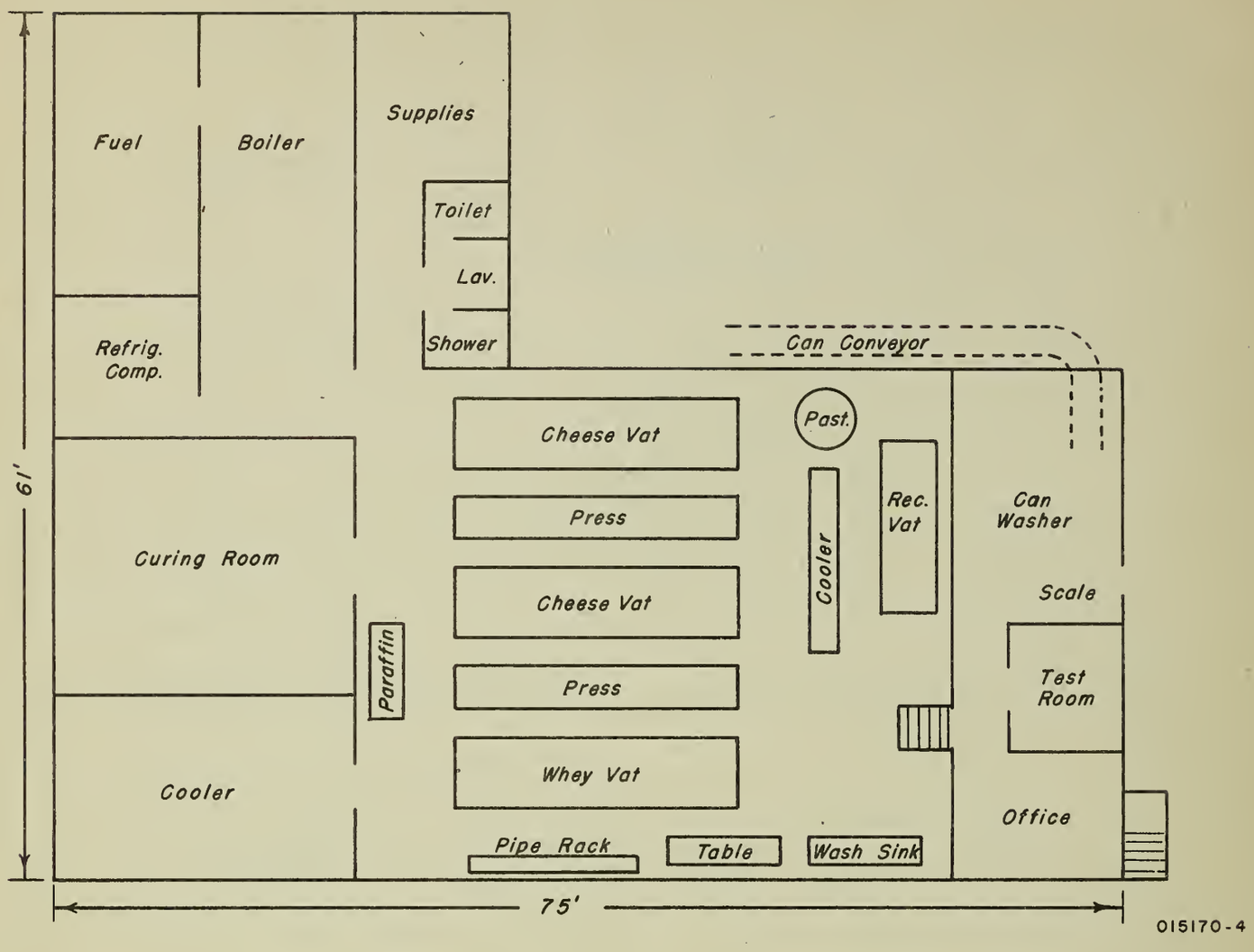

Figure 12. - Suggested floor plan for cheese plant.

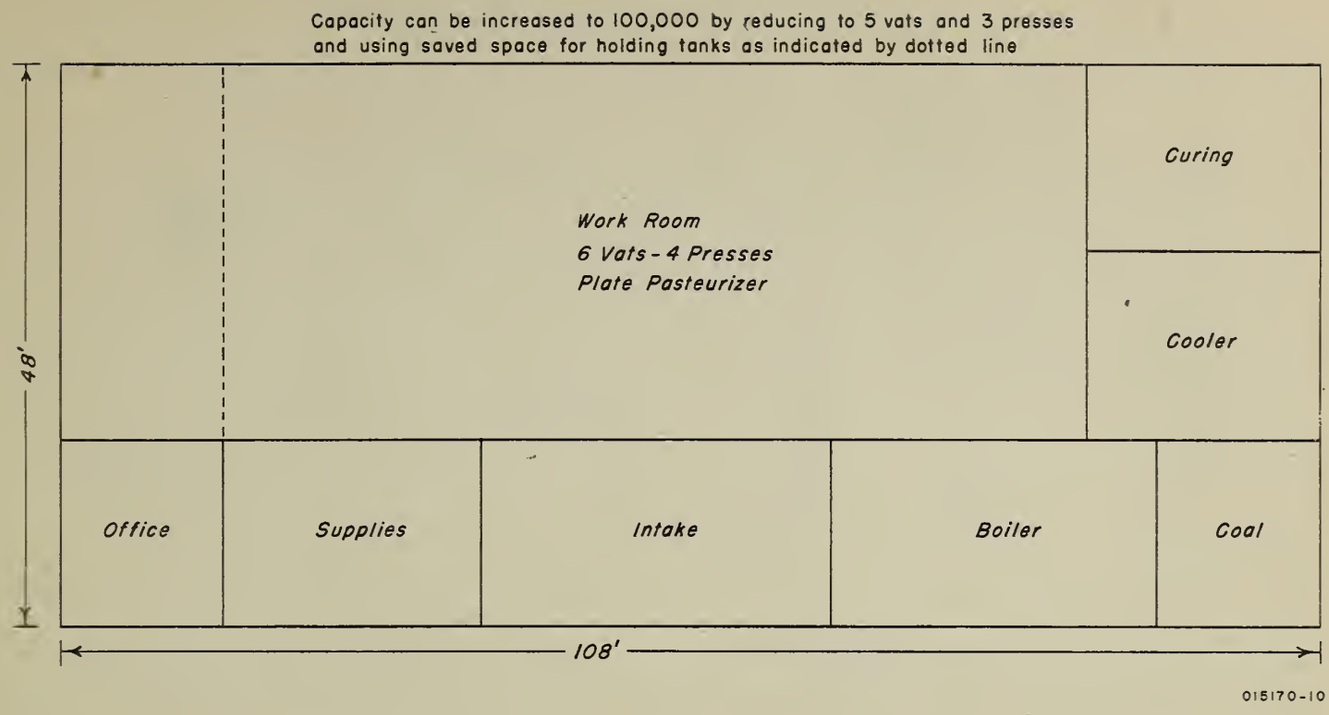

Figure 13. - Suggested floor plan for cheese plant making 60,000 pounds daily. (Modification of Damrow plan II.)

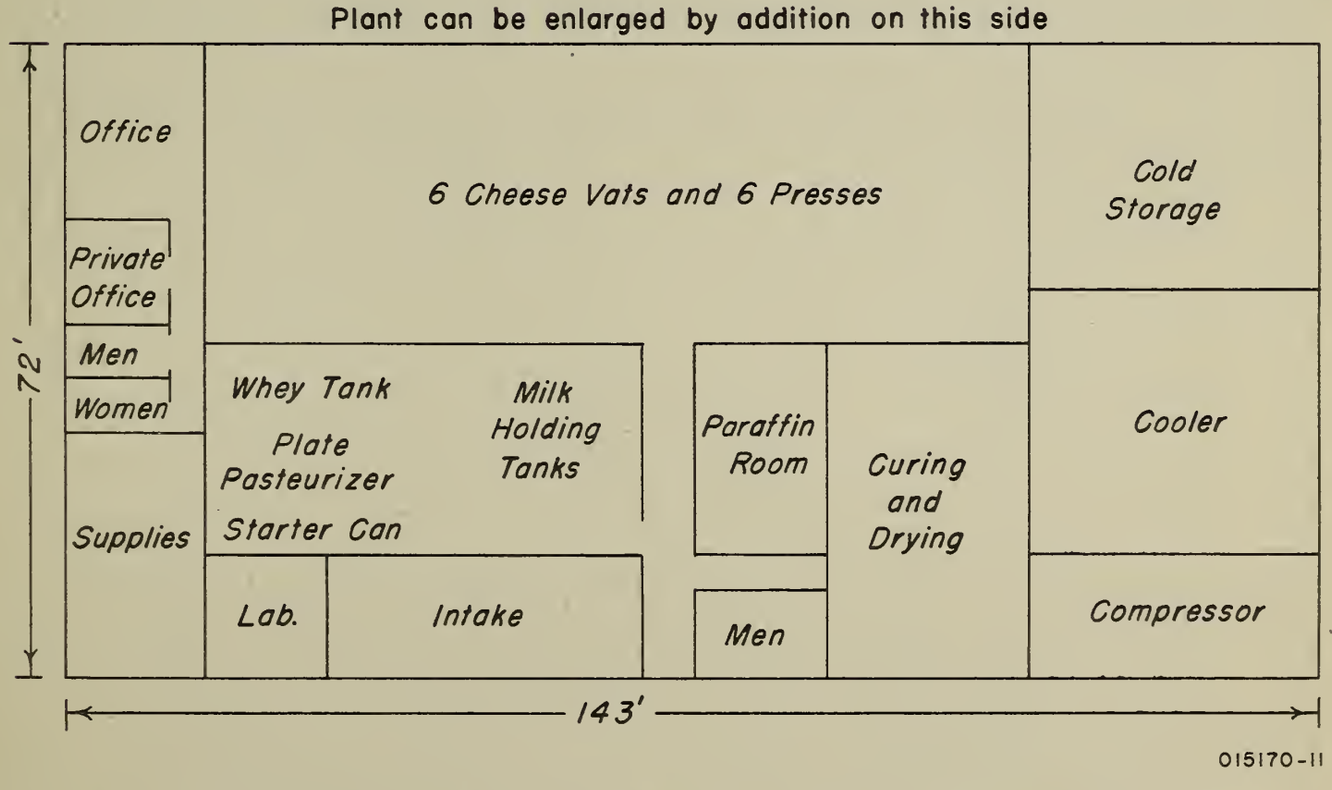

Figure 14. - Floor plan for cheese plant making over 125,000 pounds daily, with boiler room outside. (Modification of Damrow plans E-18 and E-19.)

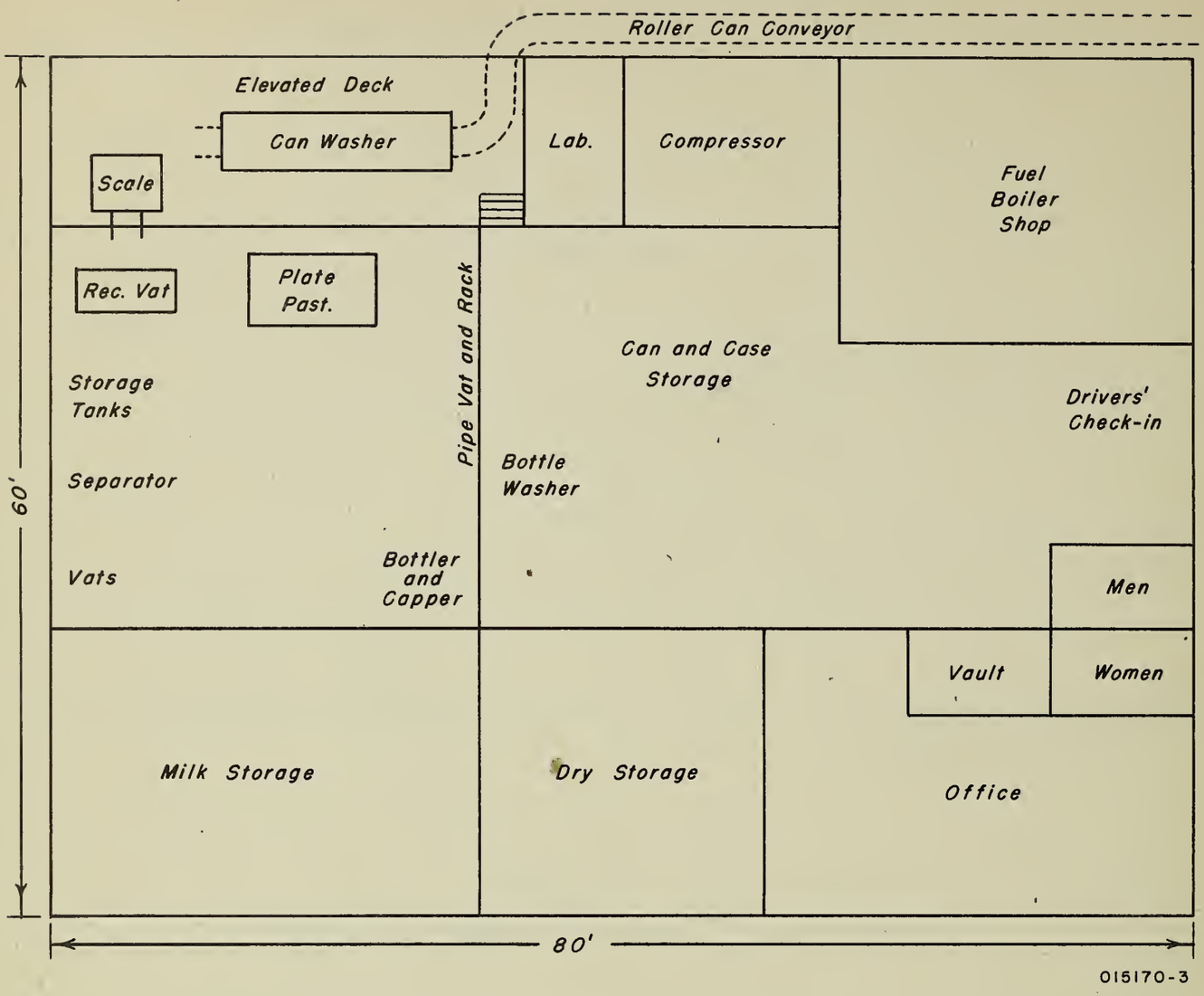

Figure 15. - Suggested floor plan for one-story pasteurizing plant, 3,000 gallons daily capacity.

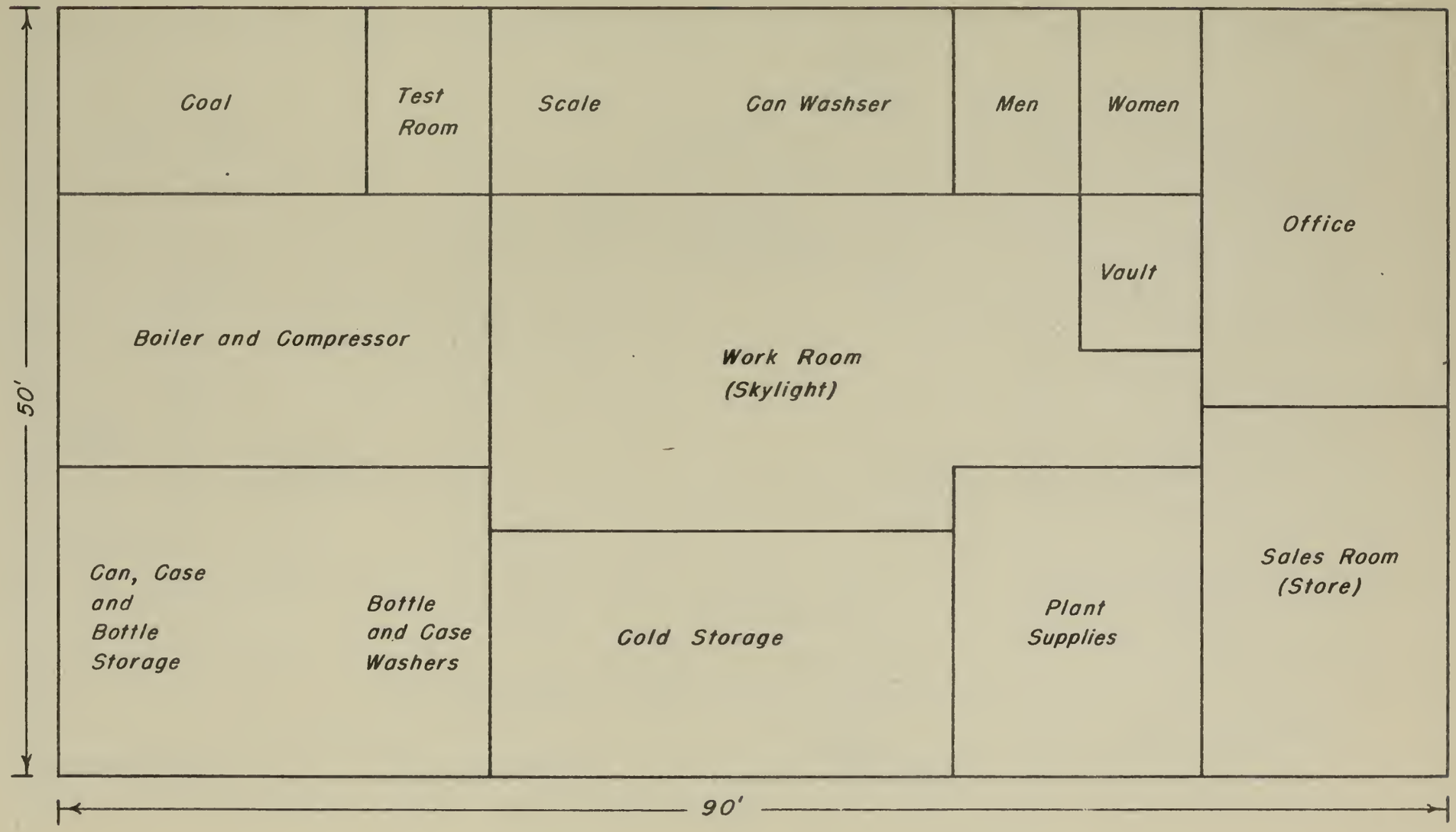

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Figure 16. - Pasteurizing plant, capacity over 2,000 gallons daily.

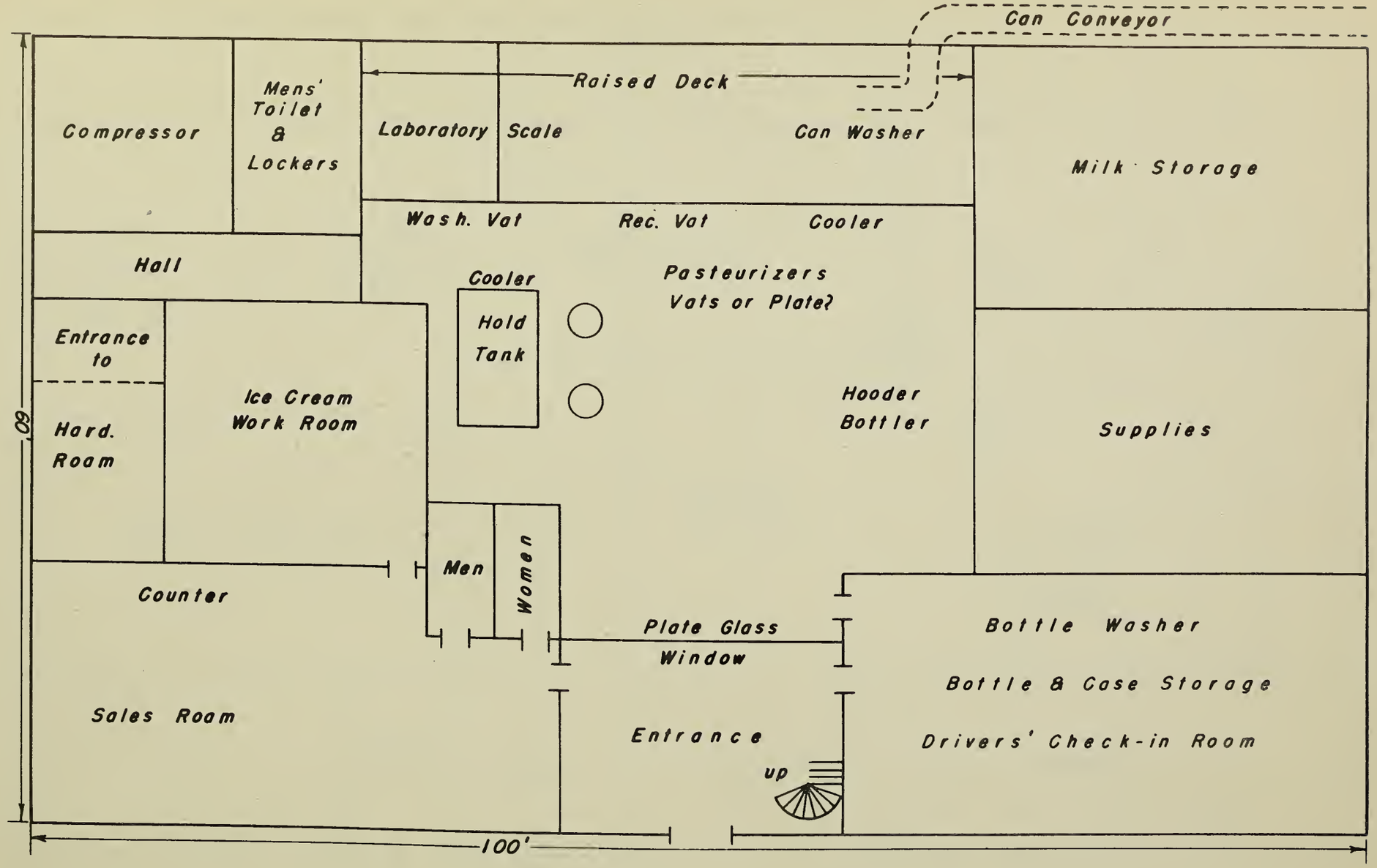

Figure 17. - Proposed floor plan for pasteurizing plant to handle 2,000 gallons a day. (First floor, boiler room outside.)

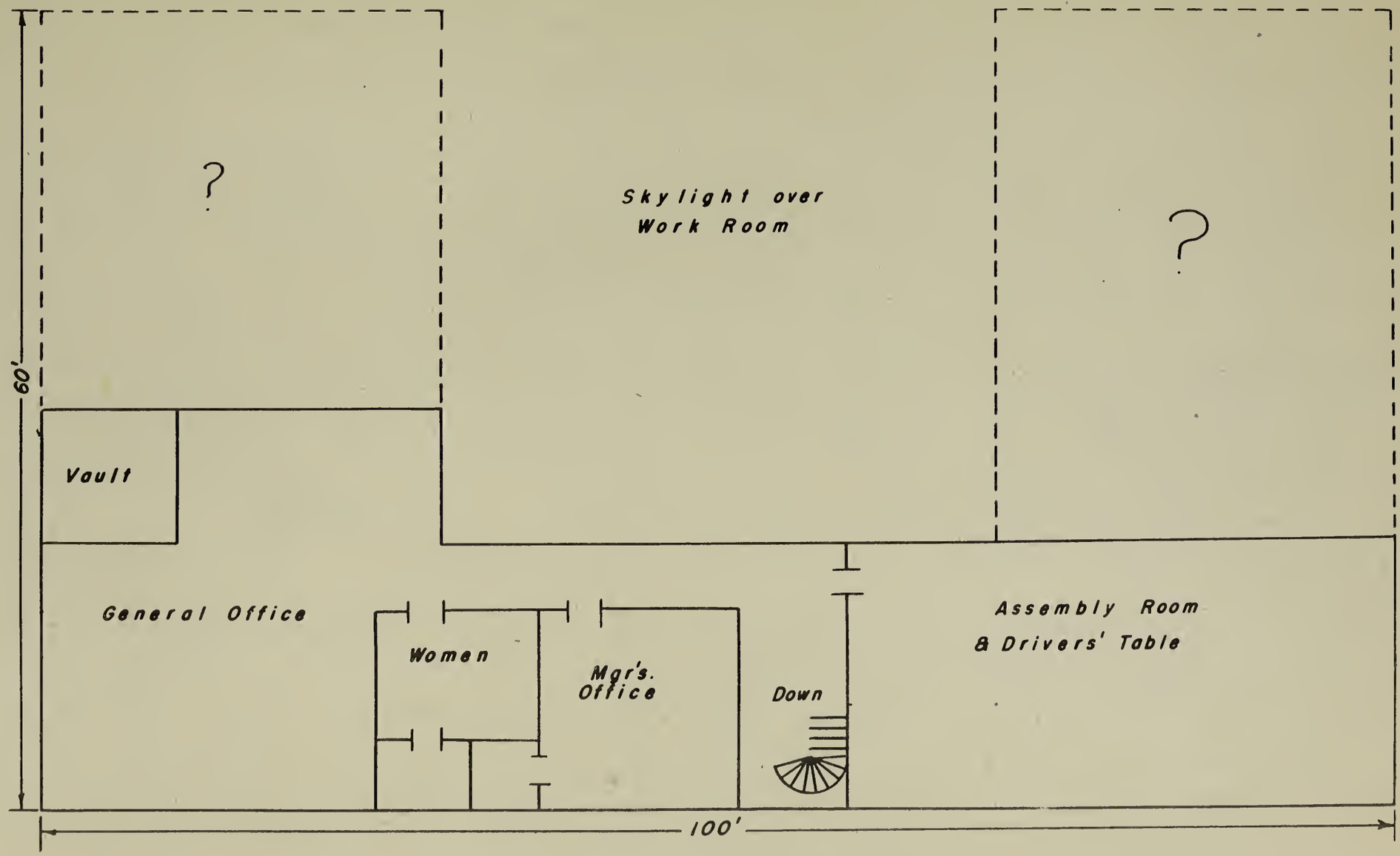

Figure 18. - Proposed floor plan for pasteurizing plant. (Second floor.)

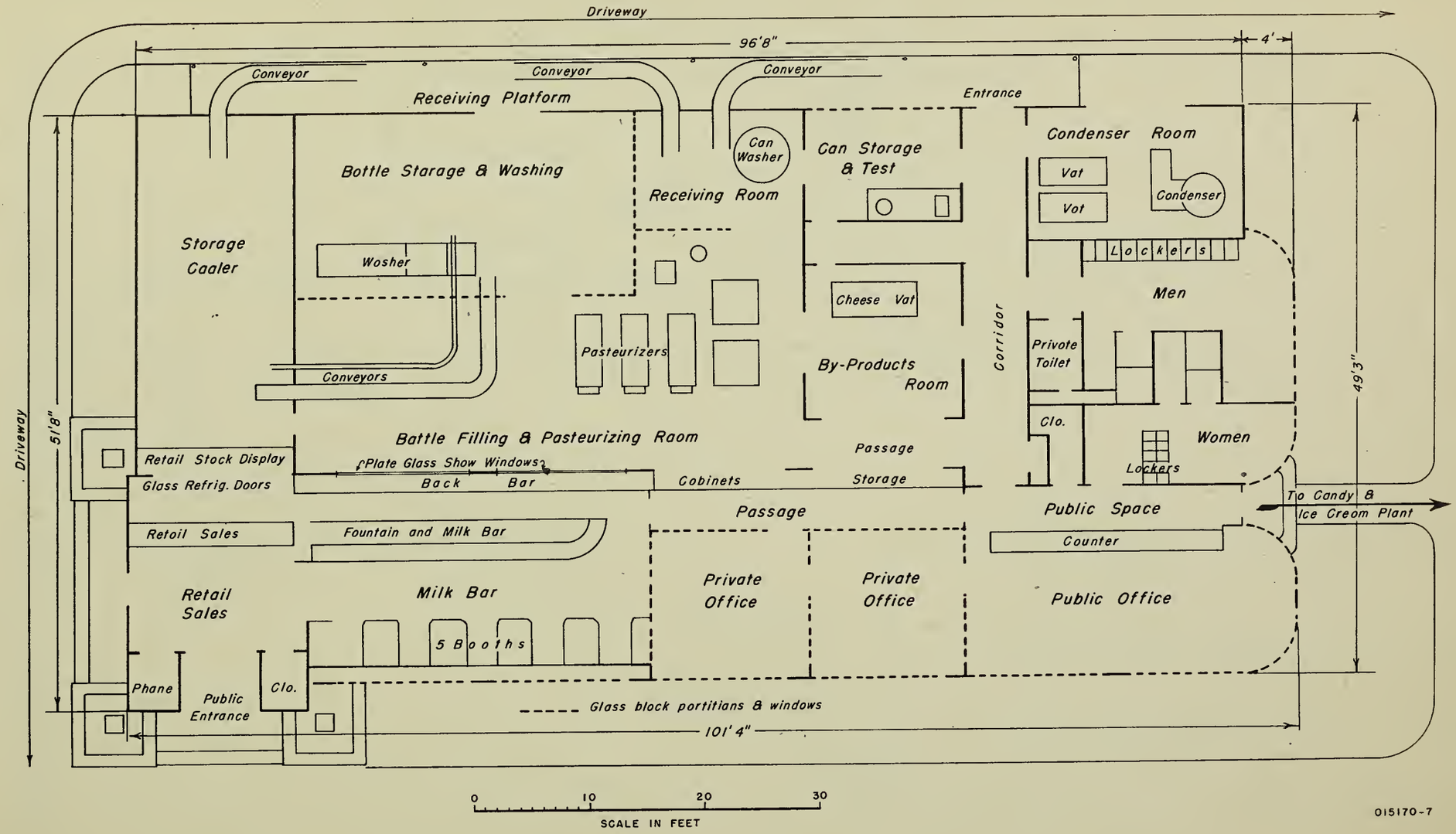

Figure 19. - Milk processing plant and office building.

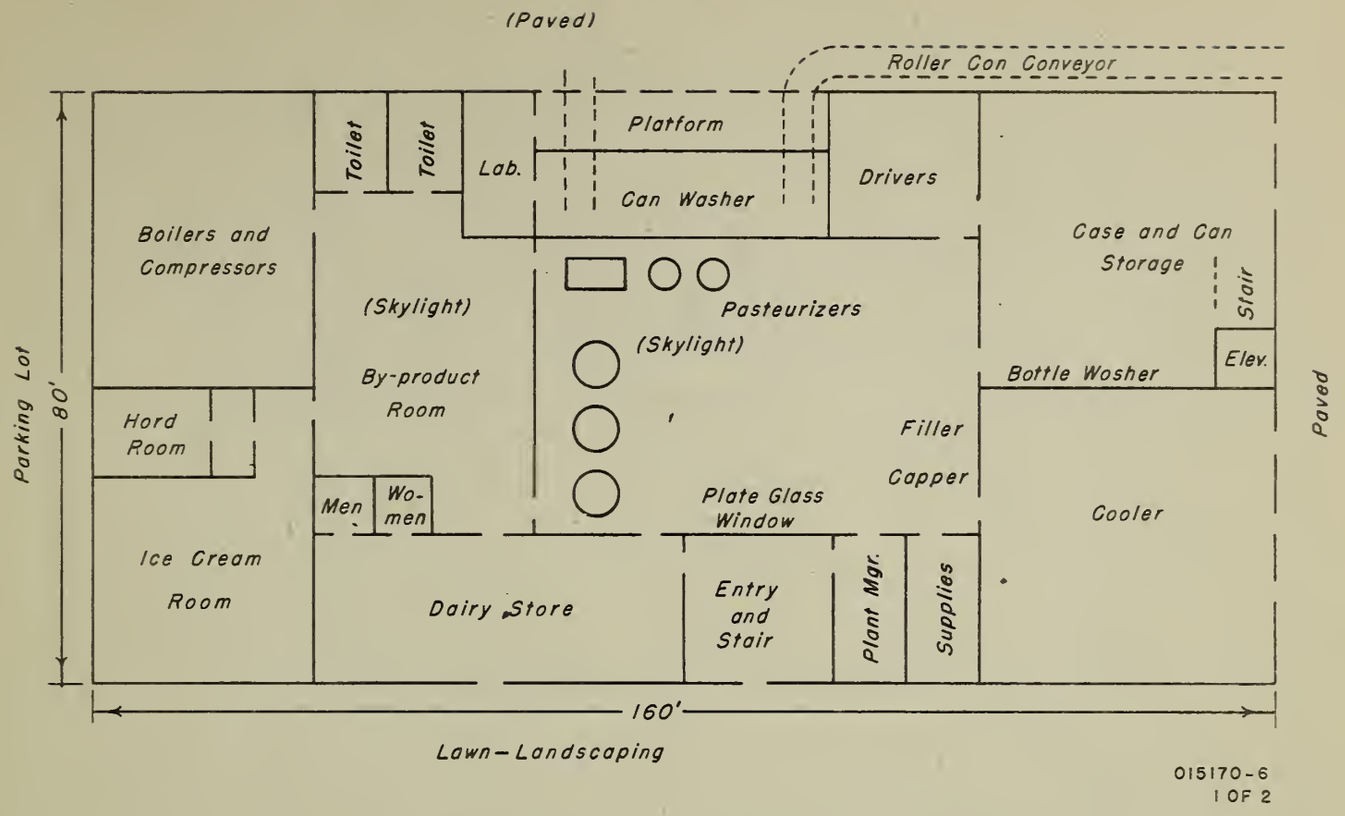

Figure 20. - Suggested floor plan for milk-pasteurizing plant of 7,500 to 10,000 gallons capacity. (First floor.)

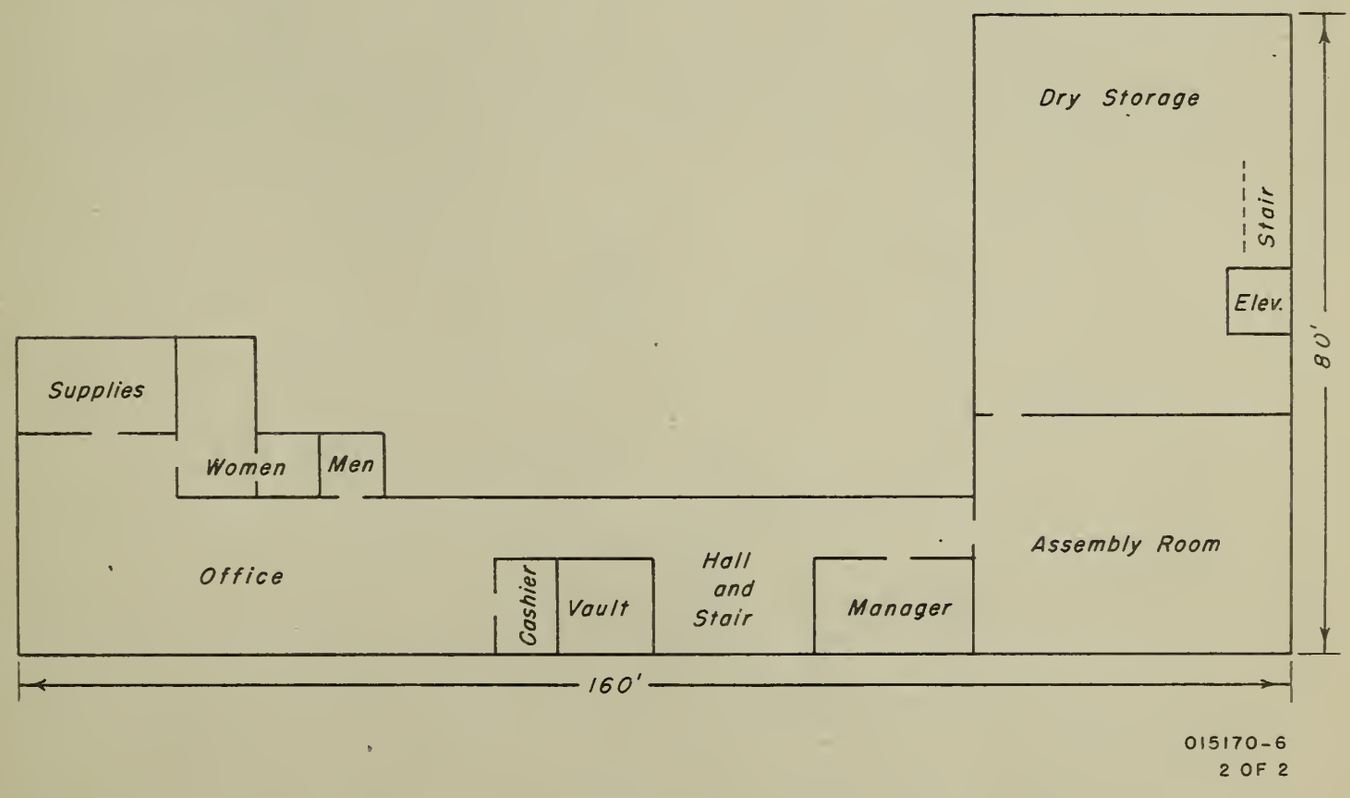

Figure 21. - Suggested floor plan for milk-pasteurizing plant of 7,500 to 10,000 gallons capacity. (Second floor.)

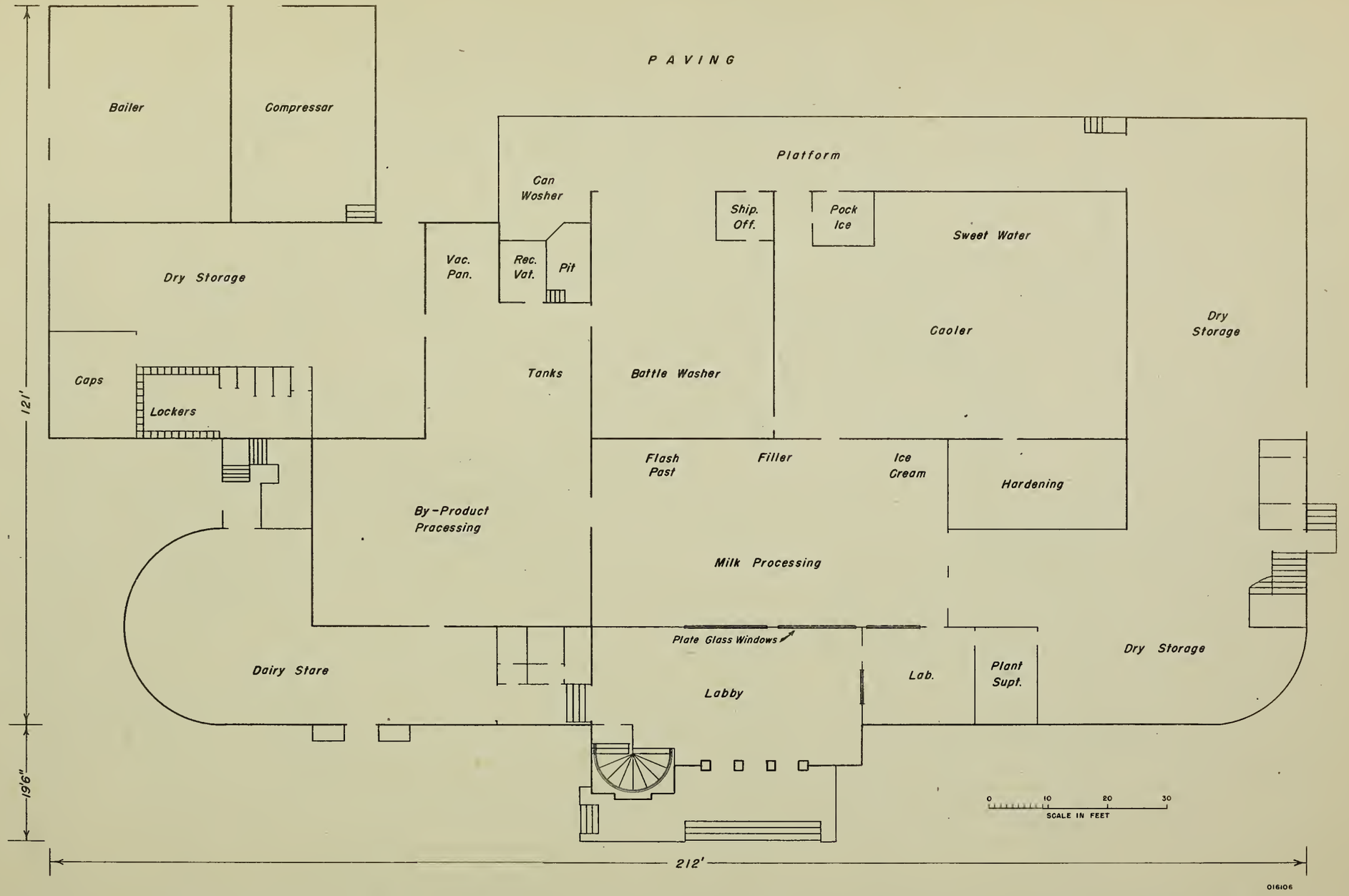

Figure 22. - Work-floor plan of a large and well arranged plant. The second-floor offices and recreation room are not shown here.

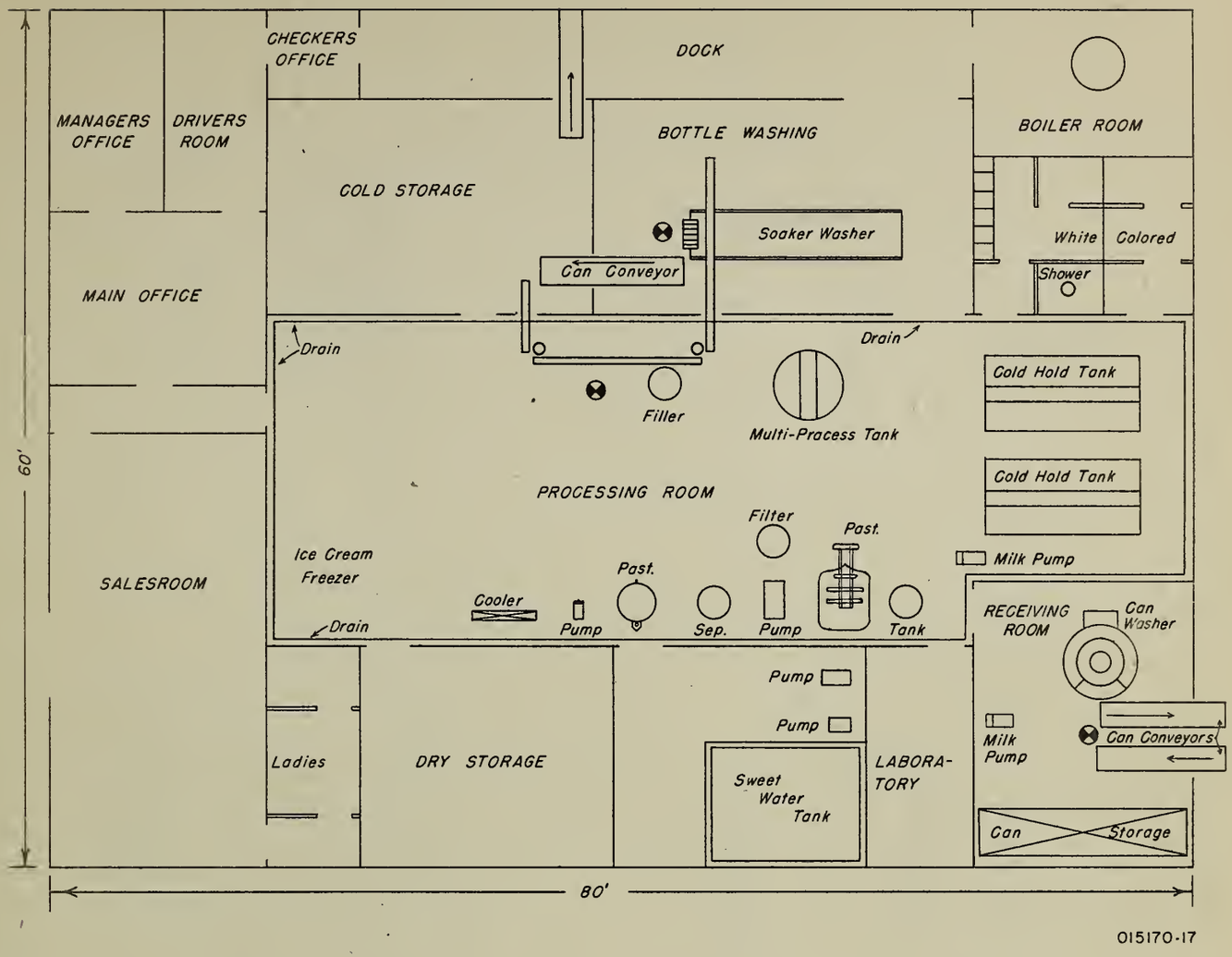

Figure 23. - Suggested plan for handling a small volume, as supplied by a manufacturer of plant equipment.

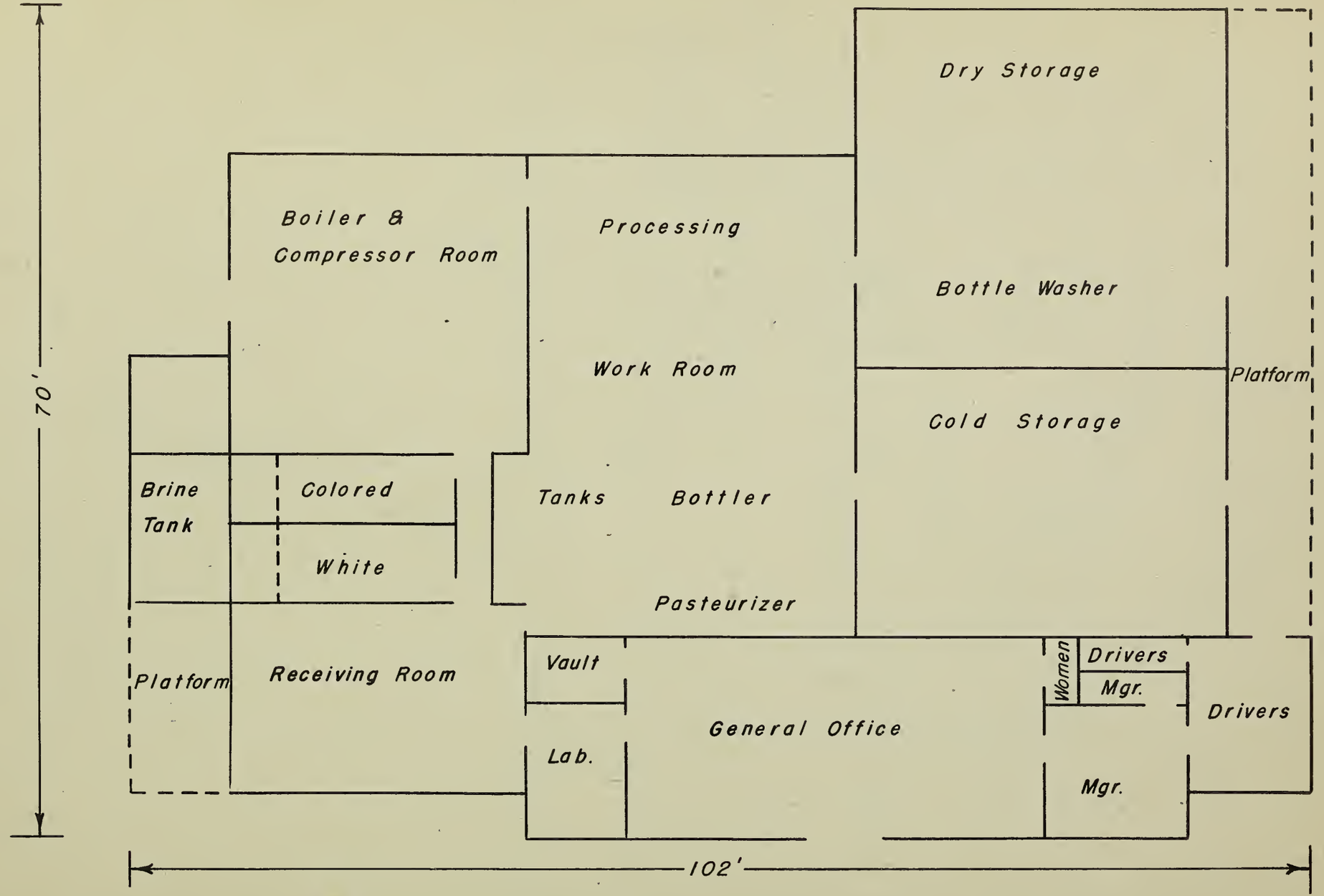

Figure 24. - Pasteurizing plant for over 2,500 gallons daily.

PASTEURIZING PLANT
OVER 4,000 GALLONS DAILY

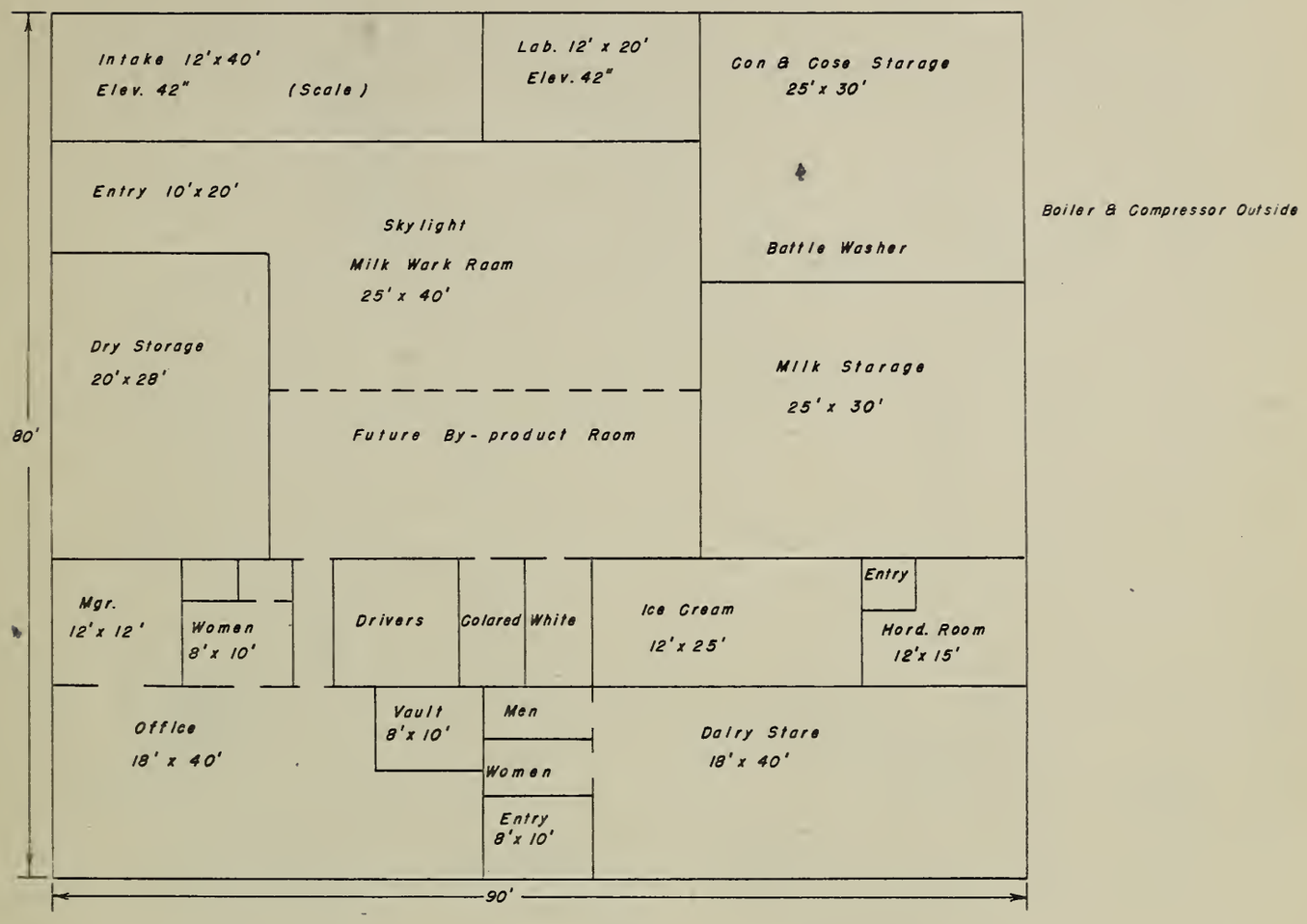

Figure 25. - Pasteurizing plant for over 4,000 gallons daily.

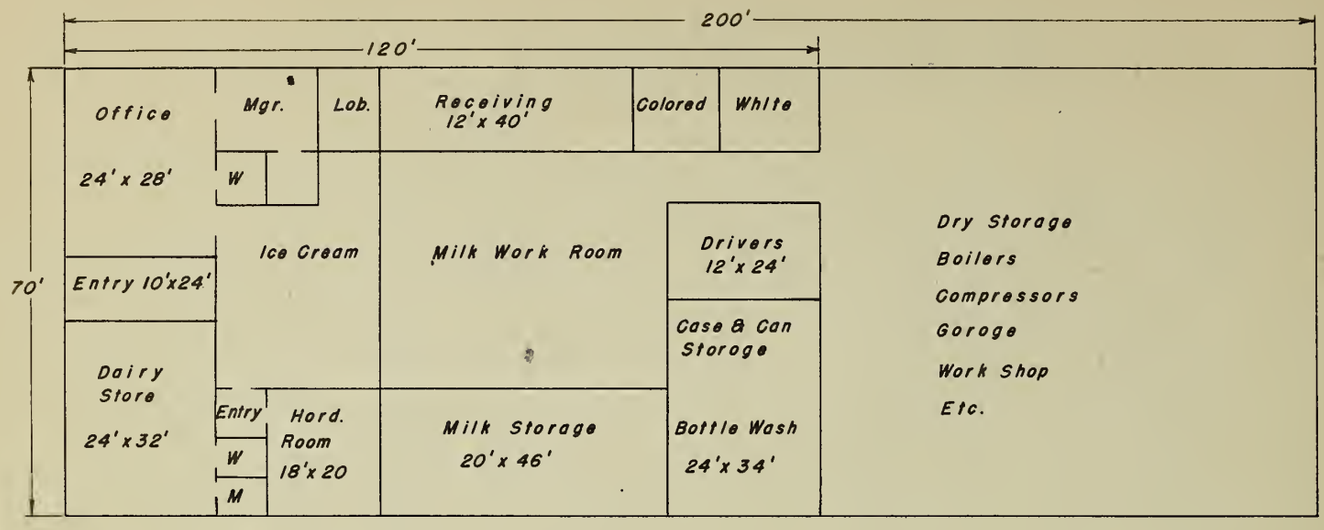

Figure 26. - Pasteurizing plant designed to present building for 5,000 gallons daily capacity.

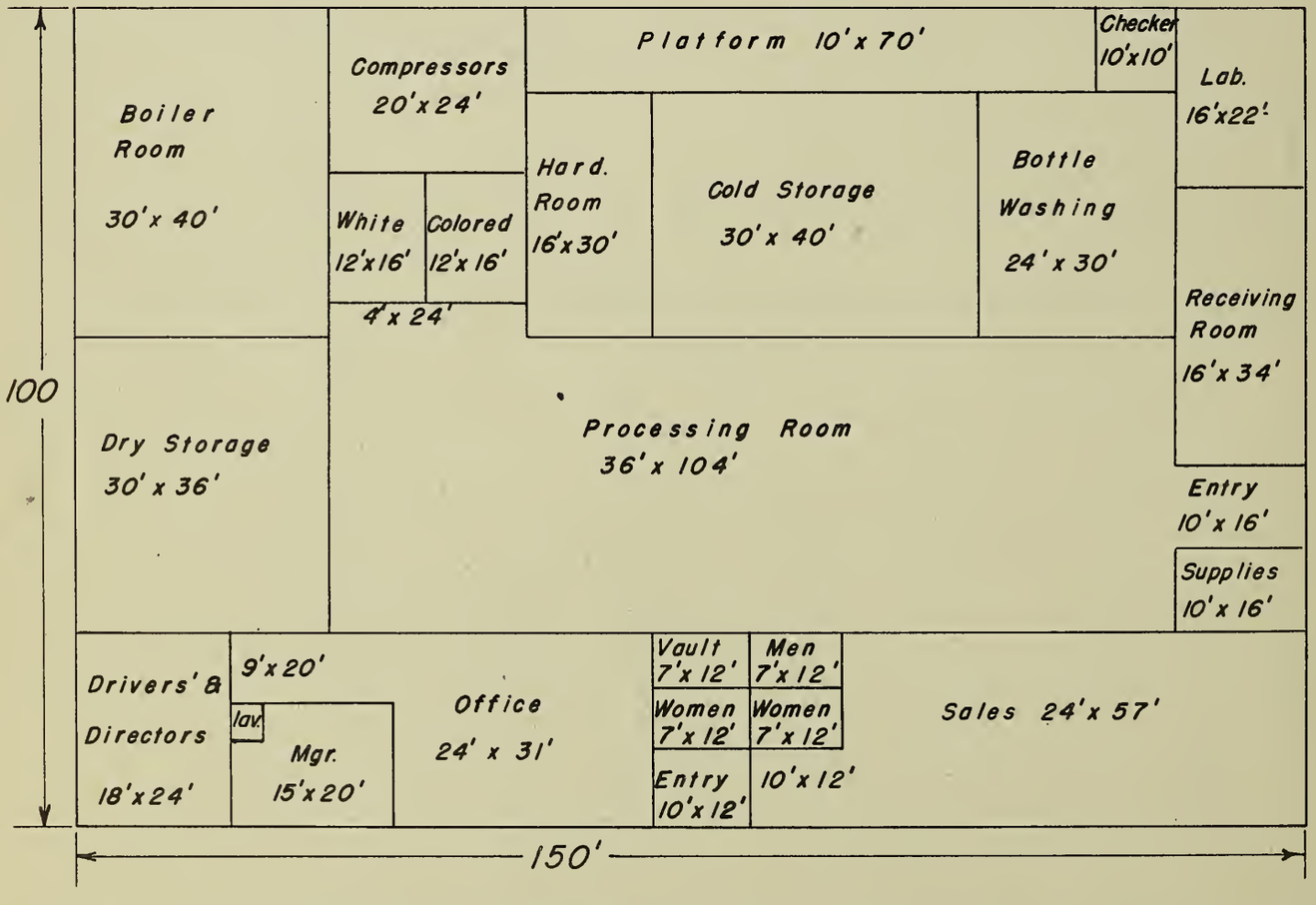

Figure 27. - Pasteurizing plant for over 5,000 gallons daily capacity, 15,000 square feet of floor space.

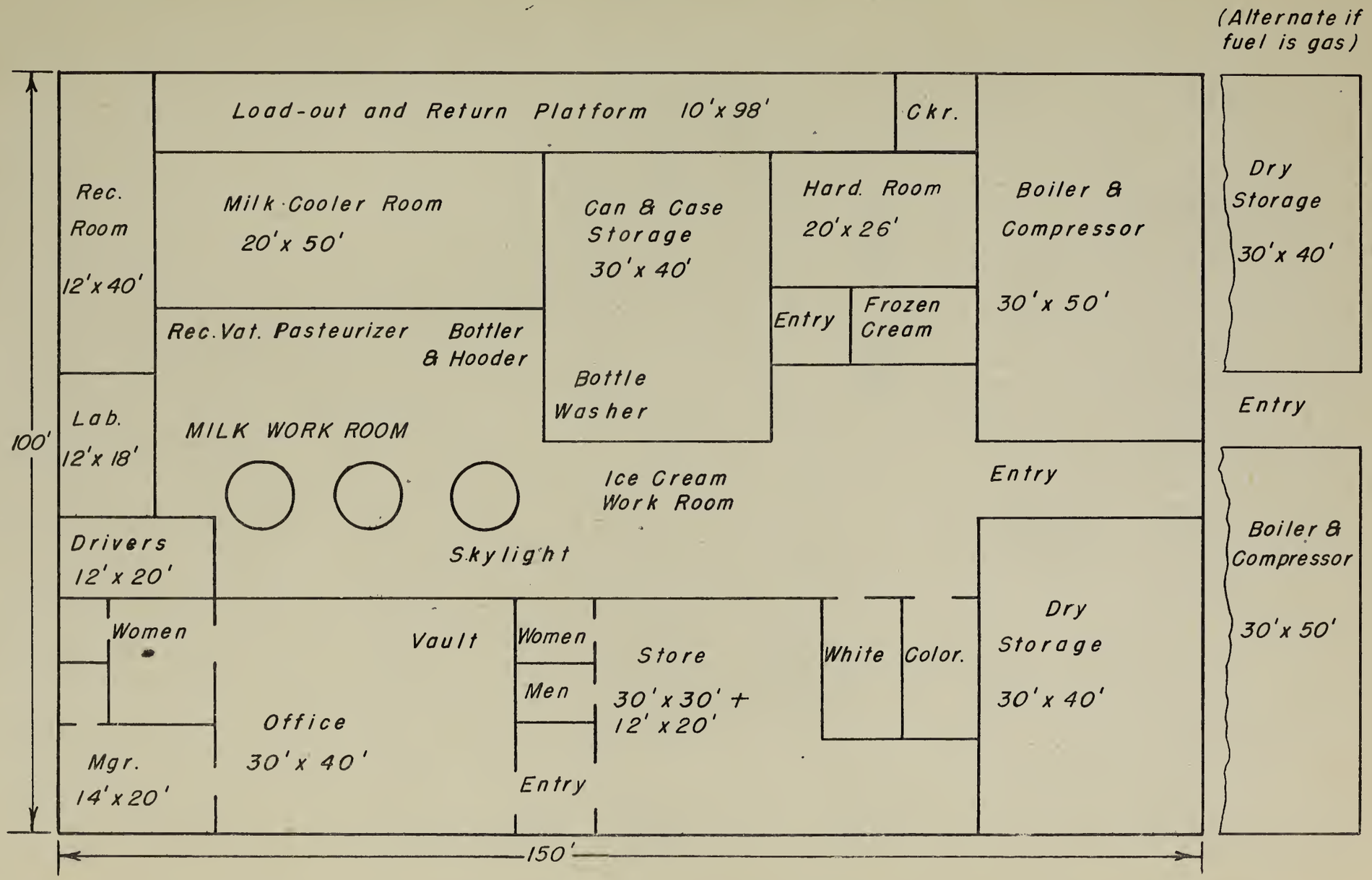

Figure 28. - Rearrangement of space in figure 27, of pasteurizing plant for over 5,000 gallons daily capacity.

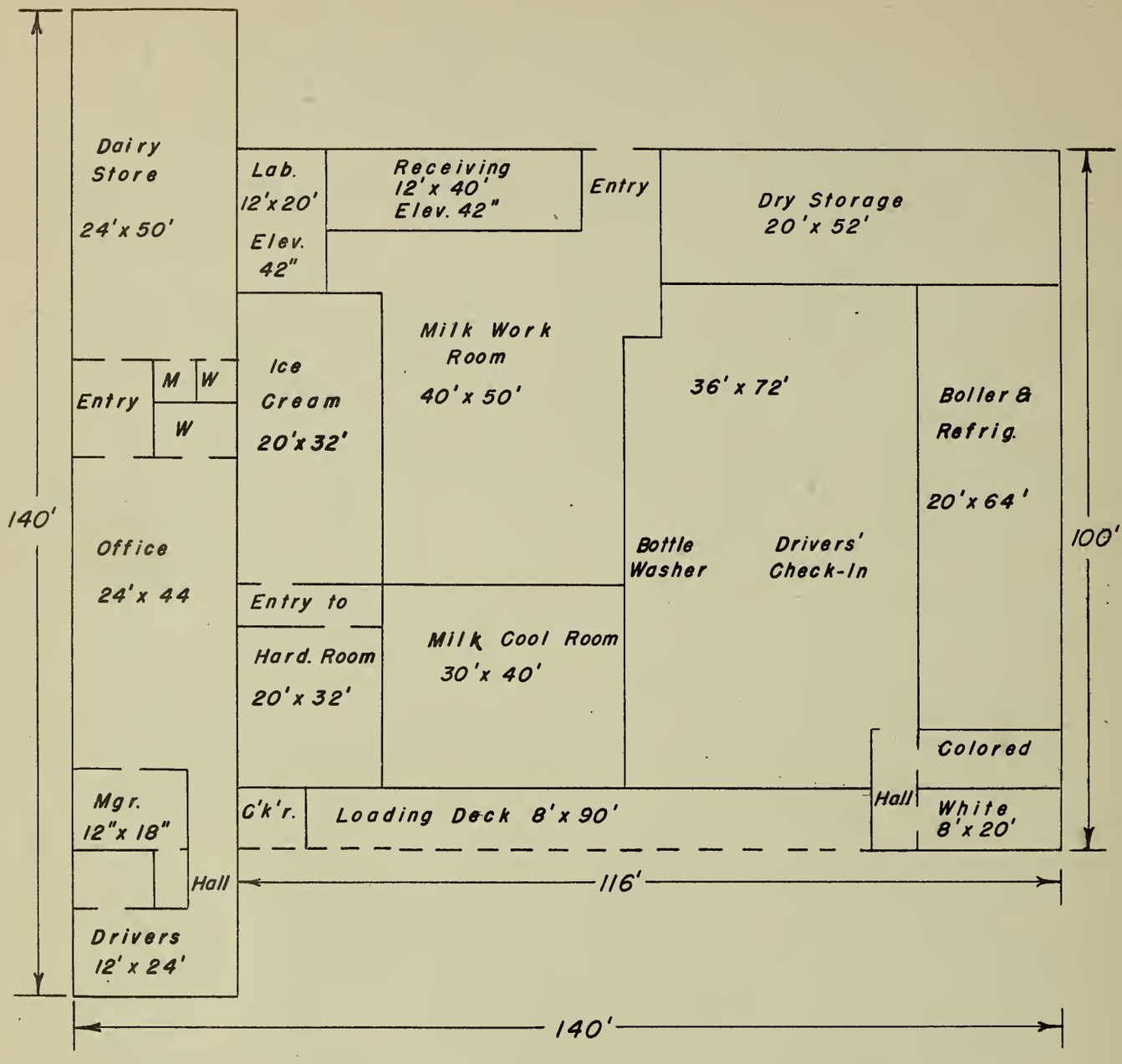

Figure 29. - Pasteurizing plant for over 5,000 gallons daily capacity, with 14,960 square feet of floor space.

U. S. DEPARTMENT OF AGRICULTURE
FARM CREDIT ADMINISTRATION
KANSAS CITY 8, MO.

OFFICIAL BUSINESS

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